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April 29, 2013

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Subject: Peach Bottom Atomic Power Station Units 2 and 3
Independent Spent Fuel Storage Installation (ISFSI)
Facility Operating License DPR-12, DPR-44 and DPR-56
NRC Docket 50-171, 50-277 and 50-278 and ISFSI Docket 72-29

Annual Radioactive Effluent Release Report 55
January 1, 2012 through December 31, 2012

Enclosed is the Annual Radioactive Effluent Release Report 55, January 1, 2012, through December 31, 2012, for Peach Bottom Atomic Power Station Units 2 and 3.

This report is being submitted in compliance with 10CFR50.36a (2) and the Technical Specifications of Operating Licenses DPR-44 and DPR-56, and to fulfill the requirements of ODCM 3.10.2. Additionally, this report is submitted to satisfy annual effluent reporting requirements for the ISFSI required by the Offsite Dose Calculation Manual (ODCM).

There was one (1) revision made to the ODCM for the 2012 reporting period.

There are no commitments contained in this letter.

If you have any questions or require additional information, please do not hesitate to contact us.

Sincerely,

Patrick Navin, Plant Manager
Peach Bottom Atomic Power Station

PDN/RJR/GRS/EAS/bcb

Enclosures (2)

cc: USNRC Region I, Regional Administrator (William Dean)
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USNRC Region I Inspector, Joe Furia

CCN 13-39

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January 1, 2012 through December 31, 2012

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PEACH BOTTOM ATOMIC POWER STATION
Unit Numbers 2 and 3
Docket Numbers 50-277 and 50-278
Unit Number 1
Docket Number 50-171
PBAPS Independent Spent Fuel Storage Installation
Docket Number 72-29

RADIOACTIVE EFFLUENT RELEASE REPORT

NO. 55

JANUARY 1, 2012 THROUGH DECEMBER 31, 2012

Submitted to
The United States Nuclear Regulatory Commission
Pursuant to
Facility Operating Licenses DPR-44 and DPR-56

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Technical Concurrence (for accuracy of information):

Chemistry, Environmental and Radioactive Waste Manager — Date: 4/22/13

Introduction

In accordance with the Reporting Requirements of Technical Specification 5.6.3 applicable during the reporting period, this report summarizes the Effluent Release Data for Peach Bottom Atomic Power Station (PBAPS) Units 2 and 3 for the period January 1, 2012 through December 31, 2012. The notations "E+" and "E-" are used to denote positive and negative exponents to the base 10, respectively, such that "3,200" would be expressed as "3.20E+03".

The release of radioactive materials during the reporting period was within the Offsite Dose Calculation Manual Specification (ODCMS) limits.

There were four (4) unplanned releases of liquid radioactive material. Two releases were from Residual Heat Removal (RHR) heat exchangers, one was from the auxiliary boiler and the last is the groundwater tritium contamination ('tritium plume').

The maximum calculated organ dose (Bone) from iodines, tritium, carbon-14 (C-14) and particulates to any individual due to gaseous effluents was 5.45E-01 mrem, which was approximately 3.76E+00% of the annual limit. The maximum calculated gamma air dose in the UNRESTRICTED AREA due to noble gas effluents was 2.32E-01 mrad, which was 1.16E+00% of the annual limit.

There were no gaseous or liquid radioactive releases from the Independent Spent Fuel Storage Installation, NRC Docket No. 72-29 (ISFSI).

Errata data for corrected gamma and beta air doses calculated for ground-level releases in 2009, 2010 and 2011. These recalculations were the result of an unverifiable change to the Offsite Dose Calculation Manual (ODCM) in 2009 which was discovered in 2012.

The ODCM was revised during the 2012 reporting period. A copy of ODCM Revision 14 is provided in Appendix B. ODCM Specifications, as a separate document (Appendix A of the ODCM) was not revised in 2012 and is therefore not included in this report.

The Radioactive Waste Process Control Program (PCP) was revised in 2012. A summary of the changes is provided on page 26 and a copy of the procedure is submitted in Appendix B.

Exelon Nuclear common procedures, which provide consistent expectations and standards for Radioactive Effluents Controls Program (RECP), were used to generate this report. They are:
CY-AA-170-000, Radioactive Effluent and Environmental Monitoring Program
CY-AA-170-100, Radiological Environmental Monitoring Program
CY-AA-170-200, Radioactive Effluent Controls Program
CY-AA-170-300, Offsite Dose Calculation Manual Administration
CY-AA-170-2000, Annual Radioactive Effluent Release Report
CY-AA-170-2100, Estimated Errors of Effluent Measurement
CY-AA-170-3100, Offsite Dose Calculation Manual Revisions

Attachment 1: Supplemental Information

Regulatory Limits

Table 1. Noble Gas Dose Rate and Dose Limits

Maximum Value	Units	Limit Classification	Specification
500	mrem/ year	total body dose rate limit	ODCM Specification 3.8.C.1.a
3000	mrem/ year	skin dose rate limit	ODCM Specification 3.8.C.1.a
10	mrad	gamma radiation air dose in a calendar quarter	ODCM Specification 3.8.C.2.a
20	mrad	beta radiation in air dose in a calendar quarter	ODCM Specification 3.8.C.2.b
20	mrad	gamma radiation in air dose in a calendar year	ODCM Specification 3.8.C.2.c
40	mrad	beta radiation in air dose in a calendar year	ODCM Specification 3.8.C.2.d

Table 2. Iodines, Tritium and Particulates (with half-lives > 8 days) Dose Rate and Dose Limits

Maximum Value	Units	Limit Classification	Specification
1500	mrem/ year	dose rate limit to any organ	ODCM Specification 3.8.C.1.b
15	mrem	dose limit to a member of the public in any calendar quarter	ODCM Specification 3.8.C.3.a
30	mrem	dose limit to a member of the public in any calendar year	ODCM Specification 3.8.C.3.b

Table 3. Liquid Effluent Activity Concentration and Dose Rate Limits

Maximum Value	Units	Limit Classification	Specification
10 times 10 CFR 20, Appendix B, Table 2, Column 2	µCi/ mL	activity concentration in all liquid releases at or beyond the site boundary	ODCM Specification 3.8.B.1.a
3.0	mrem	total body dose limit in any calendar quarter	ODCM Specification 3.8.B.2.a
10	mrem	dose limit to any organ in any calendar quarter	ODCM Specification 3.8.B.2.a
6.0	mrem	total body dose limit in any calendar quarter	ODCM Specification 3.8.B.2.b
20	mrem	dose limit to any organ in any calendar year	ODCM Specification 3.8.B.2.b

Table 4. 40 CFR 190 and 10 CFR 72.104 Annual Dose-Equivalent Limits to a Real Individual Located at or Beyond the Site Boundary from all Uranium Fuel-Cycle Sources within 8 km

Maximum Value	Units	Limit Classification	Specification
25	mrem	total body dose	ODCM Specification 3.8.D.1.a
75	mrem	thyroid dose	ODCM Specification 3.8.D.1.b
25	mrem	dose to any other critical organ other than thyroid or total body	ODCM Specification 3.8.D.1.c
3.0	mrem	dose from the liquid and gaseous effluents for whole body and the critical organ	ODCM Specification 3.8.D.1.d
55	mrem	thyroid dose from gaseous effluent only	ODCM Specification 3.8.D.1.e

Maximum Permissible Release Rates

Gaseous dose rates, rather than effluent concentrations, are used to calculate permissible release rates for gaseous releases. The maximum permissible dose rates for gaseous releases are defined in ODCMS 3.8.C.1.a and 3.8.C.1.b.

The Effluent Concentrations Limits (ECL) specified in 10 CFR 20, Appendix B, Table 2, Column 2 and multiplied by 10, for identified nuclides, are used to calculate permissible release rates and concentrations for liquid release per ODCMS 3.8.B.1.
The total activity concentration for all dissolved or entrained noble gases is limited to $\leq$ 2E-04 µCi/ml (ODCMS 3.8.B.1.b).

Average Energy

The PBAPS ODCM limits the dose-equivalent rates due to the release of noble gases to less than or equal to 500 mrem/year to the total body and less than or equal to 3000 mrem/year to the skin. Therefore, the average beta and gamma energies of the radionuclide mixture in releases of fission and activation gases as described in Regulatory Guide 1.21, Revision 1, "Measuring, Evaluation, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," are not applicable to PBAPS.

Measures and Approximations of Total Radioactivity

Fission and Activation Gases

The method used for Gamma Isotopic Analysis is the Canberra Genie System with a gas Marinelli beaker. Grab samples are taken and analyzed weekly to determine the isotopic mixture of noble gas activity released for the week. Airborne effluent gaseous activity was continuously monitored and recorded in accordance with ODCMS Table 4.8.C.1. The data from the noble gas radiation monitor was analyzed to report noble gas effluent activities. When no activity was found in the grab isotopic analysis, the isotopic mixture was assumed to be that specified in ODCM IV.B.

The activity released is listed as "unidentified" in the Attachment 2 Tables. If activity was found in the grab isotopic analysis, the isotopic mixture for the Noble Gas Monitor was determined from that isotopic mixture.

Iodines

The method used is the Canberra Genie System with a charcoal cartridge. Iodine activity was continuously sampled and analyzed in accordance with ODCMS Table 4.8.C.1.

Particulates

The method used is the Canberra Genie System with a particulate filter (47 mm). Particulate activity was continuously sampled and analyzed in accordance with ODCM Table 4.8.C.1.

Composite particulate air samples were submitted to an offsite vendor laboratory for analyses of strontium-89 (Sr-89), strontium-90 (Sr-90) and gross alpha.

Carbon-14

The amount of C-14 released was estimated using the guidance from the Electric Power Research Institute (EPRI) Technical Report 1021106, "Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents". The C-14 was released primarily through the stack (9.7E+01%) with a

small amount (3.0E+00%) through the plant vents. The effluent in liquid effluents was determined to not be significant. The resulting annual dose to a child from gaseous releases was 5.49E-01 mrem to the bone.

Liquid Effluents

Gamma isotopic activity concentrations are determined on each batch of liquid effluent prior to release using the Canberra Genie System in accordance with ODCMS Table 4.8.B.1. The total activity of a released batch is determined by multiplying each nuclide's concentration by the total volume discharged.

Composite liquid radwaste samples are analyzed for tritium on-site and submitted to an offsite vendor laboratory for analyses of iron-55, phosphorus-32, strontium-89, strontium-90 and gross alpha.

About 209 gal of water containing a total of 3.09E-03 Ci of tritium was transferred from the decommissioned Peach Bottom Atomic Power Station Unit 1 to Units 2 & 3 Liquid Radioactive Waste system via the Laundry Drain tank for ultimate release. No other radioactive constituents were identified.

Therefore, any contaminated water is always processed through the normal radioactive waste processing system prior to release to the environment. The activity and the dose contributions from Unit 1 are counted in this Radioactive Effluent Release Report for the applicable reporting periods.

Estimate of Total Error Present

CY-AA-170-2100, "Estimated Errors of Effluent Measurements", provides the methodology to obtain an overall estimate of the error associated with radioactive effluents.

Batch Releases

Table 5. Quarterly Liquid Batch Release Statistics

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Number of Batch Releases	17	1	20	2
Total Time for Batch Releases (minutes)	1.71E+03	1.17E+02	4.69E+03	2.36E+03
Maximum time period for batch release (minutes)	2.70E+02	1.17E+02	3.35E+02	1.76E+03
Average time period for batch release (minutes)	1.01E+02	1.17E+02	2.34E+02	1.18E+03
Minimum time period for batch release (minutes)	3.50E+01	1.17E+02	3.00E+01	6.00E+02
Average Stream Flow[1]	4.78E+04	3.48E+04	9.73E+03	3.25E+04
Dilution volume (liters)	4.92E+09	5.32E+08	1.70E+10	1.73E+09

Table 6. Quarterly Gaseous Batch Release Statistics

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Number of batch releases:	0	0	0	0
Total Time for batch releases (minutes)	N/A	N/A	N/A	N/A
Maximum time period for batch release (minutes):	N/A	N/A	N/A	N/A
Average time period for batch release (minutes)	N/A	N/A	N/A	N/A
Minimum time period for batch release (minutes)	N/A	N/A	N/A	N/A

Average Stream Flow

The river flow is not used for dose calculations. The actual flow rate of Circulation Water (the water that is circulated within the plant for cooling) is determined for each liquid effluent release because this Circulation Water provides dilution and therefore reduces the projected dose.

[1] Average Stream Flow is not used for dose calculation.

The Circulation Water flow rate varies from as low as 675,000 gpm in the winter to as high as 1,350,000 gpm in the summer because the thermal cooling needs vary with the temperature of the intake water.

Abnormal Releases

Abnormal Liquid Effluent Releases

1. **2A RHR to High Pressure Service Water (HPSW) leak**

On June 12, 2012, plant operators received indication of a small leak (approximately 1.79E-01 gpm) in the Unit 2 A Residual Heat Removal (RHR) Exchanger. Chemistry sampling confirmed the presence of a leak in the HPSW effluent to the discharge canal detected low-level radioactive contamination. The 2A RHR ceased to be a source of contamination as the leak was repaired sucessfully in September 2012.

Analysis of Release

It was estimated that the contaminated water released to the discharge canal for all of 2012 was responsible for 1.71E-04 mrem total body dose (Adult), and 2.68E-04 mrem Critical Organ (Teen Liver) dose. This dose contribution was well below the limits specified in the ODCM.

Samples were analyzed for all the parameters of radioactive effluent releases. Composite liquid radwaste samples counted for tritium and submitted to an offsite vendor laboratory for analyses of Fe-55, P-32, Sr-89, Sr-90 and gross alpha. The dose contributions and isotope quantities from the releases were added to this Radioactive Effluent Release Report for the applicable reporting periods.

2. **2D RHR to High Pressure Service Water (HPSW) leak**

On September 5, 2012, sampling of the HPSW effluent to the discharge canal detected low-level radioactive contamination which indicated a small leak (8.50E-02 gpm). Subsequent investigation determined that primary coolant water was leaking through the Unit 2D RHR heat exchanger into the 2D loop of the HPSW system. The 2D RHR ceased to be a source of contamination as the leak was repaired successfully in September 2012.

Analysis of Release

It was estimated that the contaminated water released to the discharge canal for all of 2012 was responsible for 3.15E-05 mrem total body dose (Adult), and 4.95E-05 mrem Critical Organ (Teen Liver) dose. This dose contribution was well below the limits specified in the ODCM.

Samples were analyzed for all the parameters of radioactive effluent releases. Composite liquid radwaste samples counted for tritium and submitted to an offsite vendor laboratory for analyses of Fe-55, P-32, Sr-89, Sr-90 and gross alpha. The dose contributions and isotope quantities from the releases were added to this Radioactive Effluent Release Report for the applicable reporting periods.

3. Ground Water Tritium Plume

During 2012, during the sampling and analysis of the Radiological Ground Water Protection Program (RGPP), tritium was measured at several locations around the site. The ground water that has detectable tritium has been determined to be discharged into the intake or discharge canal.

Analysis of Release

It was estimated that the ground water flowed to the discharge canal at a rate of 175 GPM. With the concentration ranging from 8.46E-06 µCi/ml to 2.31E-05 µCi/ml, the ground water released to the discharge canal was responsible for 4.62E-05 mrem total body dose (Child), and 4.62E-05 mrem Critical Organ dose (Child Liver)[2]. This dose contribution projection is well below the limit specified in the ODCM.

4. Auxiliary Boiler Contamination

In November 2012, a small amount of contamination was found in the B Auxiliary Boiler water during the course of routine sampling by the Licensee. This contamination was found using gamma spectroscopy and indicated the presence of power-production nuclides. A sample of this water was also sent off-site to a contract laboratory for radionuclides that are not detectable by gamma spectroscopy. The analyses indicated that the boiler water had a concentration of 3.57E-07 µCi/ mL Co-60, 4.21E-07 µCi/ mL Mn-54 and 2.36E-06 µCi/ mL. Because this system is not a system which is designed for radioactive contamination, two blowdowns of the boiler were performed to reduce concentration of these nuclides to below detectable levels.

[2] The numerical values for dose are identical because the ingestion dose factors for all organs (except bone) are identical for the child in the liquid pathway.

Analysis of Release

These blowdowns were abnormal releases to the Discharge Canal and were subject to further dilution prior to discharge to the unrestricted area beyond the site boundary. The maximum projected organ dose to the public as a result of this release was the Adult GI-LLI at 9.48E-04 mrem, which is 0.34% of the limit; the maximum projected Total Body dose to the limiting receptor (here, calculated to be "Child") was found to be 9.71E-05 mrem, which is 0.081% of the limit. These dose contribution projections are well below the limits specified in the ODCM.

Abnormal Gaseous Effluent Releases

No abnormal gaseous effluent releases are reported for 2012.

Changes to the ODCM

In November 2012, the ODCM was revised to fix an error found as a result of a preparation of a draft to the ODCM which had been in progress. It was found that the highest annual average noble gas reactor building vent dispersion factor (which is known by the symbol "$(X/Q)_V$") was changed in 2008 but was not communicated to Emergency Preparedness (EP) such that an evaluation on the Site's Emergency Action Levels (EAL) could be performed. The latest validated meteorology data was utilized to determine this constant from the last ten years.

Minimum Detectable Concentrations

If a radionuclide was not detected, "<LLD" was reported as the activity. Samples were analyzed with techniques that achieved the required Lower Limits of Detection (LLD) as specified in ODCMS Table 4.8.B.1, "Radioactive Liquid Waste Sampling and Analysis" (for liquids) or OCDMS Table 4.8.C.1, "Radioactive Gaseous Waste Sampling and Analysis from Main Stack and Vent Stack" (for gases). In all cases, the LLD requirements were satisfied.

Violations

There were no violations for the 2012 reporting period.

Dose Assessment

Liquid doses were calculated using the LADTAP function of NRCDOSE, version 2.3.9, for Windows. The average river flow for 2012 of 3.12E+04 cubic feet per second was used in the code. The maximum projected annual doses were 4.57E-06 mrem to the Adult Total Body and 6.51E-06 mrem to the Child Liver. These doses were less than the doses calculated in accordance with the ODCM.

Gaseous doses were calculated using the GASPAR function of NRCDOSE, version 2.3.9, for Windows. The average meteorology for 2012 was used to calculate the doses for noble gases, I-131, I-133, tritium, C-14 and particulates. The projected doses were calculated for three

potential nearest MEMBER OF THE PUBLIC. The resident in the SSE sector at 1148 meters (3766 ft, 0.74 mi) was found to be the limiting MEMBER OF THE PUBLIC. The maximum annual doses were 1.59E-01 mrem to the child bone, 4.18E-02 mrad beta air dose, 2.17E-01 mrad gamma air dose.

These doses, using the NRCDOSE code, were less than the doses calculated in accordance with the ODCM, which shows that the ODCM methodology is more limiting.

Attachment 2: Effluent Summary

Gaseous Effluents - Summation of All Releases

Period: January 1, 2012 through December 31, 2012 **Unit: Peach Bottom**

A. Fission & Activation Gases	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error %
1. Total Release	Ci	1.44E+02	1.15E+02	1.45E+02	1.15E+02	3.51E+01
2. Average release For the Period	µCi/ s	1.85E+01	1.46E+01	1.83E+01	1.45E+01	
3. Gamma Air Dose	mrad	6.07E-02	4.74E-02	5.44E-02	4.25E-02	
4. Beta Air Dose	mrad	7.91E-02	6.19E-02	7.11E-02	5.56E-02	
5. Percent of ODCM limit						
Gamma Air Dose	%	6.07E-01	4.74E-01	5.44E-01	4.25E-01	
Beta Air Dose	%	3.96E-01	3.10E-01	3.56E-01	2.78E-01	

B. Iodines

1. Total I-131	Ci	1.05E-04	2.00E-04	2.07E-04	6.03E-05	1.76E+01
2. Average release For the Period	µCi/ s	1.35E-05	2.54E-05	2.60E-05	7.59E-06	
3. Percent of ODCM limit	%	*	*	*	*	

C. Particulate

1. Particulates with T1/2 > 8 days	Ci	4.96E-05	1.97E-04	2.60E-04	1.02E-04	1.94E+01
2. Average release For the Period	µCi/ s	6.38E-06	2.50E-05	3.27E-05	1.29E-05	
3. Percent of ODCM limit	%	*	*	*	*	

D. Tritium

1. Total Release	Ci	1.43E+01	2.29E+01	1.33E+01	6.22E+00	1.11E+01
2. Average release For the Period	µCi/ s	1.84E+00	2.91E+00	1.67E+00	7.83E-01	
3. Percent of ODCM limit	%	*	*	*	*	

E. Gross Alpha

1. Total Release	Ci	<LLD	<LLD	<LLD	<LLD	4.00E+02
2. Average release For the Period	µCi/ s	<LLD	<LLD	<LLD	<LLD	
3. Percent of ODCM limit	%	*	*	*	*	

F. Carbon-14

1. Total Release	Ci	8.87E+00	8.87E+00	8.87E+00	8.87E+00
2. Average release For the Period	µCi/ s	1.14E+00	1.13E+00	1.12E+00	1.12E+00

G. Iodine-131, 133 and 135, Tritium, Carbon-14 & Particulate

1. Organ Dose	mrem	8.17E-02	8.17E-02	8.17E-02	8.17E-02
2. Percent ODCM limit	%	5.45E-01	5.45E-01	5.45E-01	5.45E-01

* ODCM Limit is given as the combined total for all I-131, I-133, H-3, C-14 and Particulate in Section G.

Gaseous Effluents for Elevated Release Point - Main Stack

Period: January 1, 2012 through December 31, 2012 **Unit: Peach Bottom**

Nuclides Released		Continuous Mode				Batch Mode			
1. Fission Gases	**Unit**	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**
Kr-85	Ci	<LLD	<LLD	1.68E+00	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	<LLD	3.78E+00	8.40E+00	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	5.40E+00	1.77E+01	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	6.39E-01	1.43E+00	5.55E+00	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	1.93E+00	3.17E-01	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ar-41	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Unidentified	Ci	1.669E+01	5.58E+00	1.42E+00	1.99E+01	<LLD	<LLD	<LLD	<LLD
Total For Period	Ci	1.86E+01	1.57E+01	3.06E+01	2.54E+01	<LLD	<LLD	<LLD	<LLD
2. Iodines									
I-131	Ci	6.92E-05	6.41E-05	8.07E-05	3.98E-05	<LLD	<LLD	<LLD	<LLD
I-133	Ci	9.91E-05	1.05E-04	2.08E-04	6.39E-05	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	3.46E-05	<LLD	<LLD	<LLD	<LLD	<LLD
Total For Period	Ci	1.68E-04	1.69E-04	3.24E-04	1.04E-04	<LLD	<LLD	<LLD	<LLD
3. Particulates									
Sr-89	Ci	3.54E-05	4.12E-05	5.55E-05	7.57E-05	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	2.84E-07	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	2.96E-06	1.07E-05	4.84E-06	2.91E-06	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	1.25E-06	6.28E-06	2.29E-06	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	2.52E-06	<LLD	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	3.75E-06	1.90E-05	5.09E-05	1.85E-05	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	3.23E-07	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Fe-59	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-57	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Zn-65	Ci	<LLD	4.21E-06	1.48E-05	2.79E-06	<LLD	<LLD	<LLD	<LLD
Ru-103	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total For Period	Ci	4.21E-05	7.67E-05	1.35E-04	1.02E-04	<LLD	<LLD	<LLD	<LLD
4. Tritium									
H-3	Ci	3.33E-01	6.12E-01	2.70E+00	1.99E+00	<LLD	<LLD	<LLD	<LLD
5. Gross Alpha									
Gross Alpha	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
6. Carbon-14									
C-14	Ci	8.61E+00	8.61E+00	8.61E+00	8.61E+00	<LLD	<LLD	<LLD	<LLD

Gaseous Effluents for Ground Level Release Point - Unit 2 and Unit 3 Roof Vents

Period: January 1, 2012 through December 31, 2012 **Unit: Peach Bottom**

Nuclides Released		Continuous Mode				Batch Mode			
1. Fission Gases	**Unit**	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ar-41	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Unidentified	Ci	1.26E+02	9.92E+01	1.15E+02	8.96E+01	<LLD	<LLD	<LLD	<LLD
Total For Period	Ci	1.26E+02	9.92E+01	1.15E+02	8.96E+01	<LLD	<LLD	<LLD	<LLD
2. Iodines									
I-131	Ci	3.55E-05	1.36E-04	1.26E-04	2.06E-05	<LLD	<LLD	<LLD	<LLD
I-133	Ci	<LLD	4.50E-04	2.15E-04	8.16E-05	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total For Period	Ci	3.55E-05	5.86E-04	3.41E-04	1.02E-04	<LLD	<LLD	<LLD	<LLD
3. Particulates									
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	7.56E-06	1.20E-04	1.25E-04	<LLD	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Fe-59	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-57	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Zn-65	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ru-103	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total For Period	Ci	7.56E-06	1.20E-04	1.25E-04	<LLD	<LLD	<LLD	<LLD	<LLD
4. Tritium									
H-3	Ci	1.40E+01	2.23E+01	1.06E+01	4.23E+00	<LLD	<LLD	<LLD	<LLD
5. Gross Alpha									
Gross Alpha	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
6. Carbon-14									
C-14	Ci	2.66E-01	2.66E-01	2.66E-01	2.66E-01	<LLD	<LLD	<LLD	<LLD

Liquid Effluents - Summation of All Releases

Period: January 1, 2012 to December 31, 2012 **Unit: Peach Bottom**

A. Fission & Activation Gases	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error %
1. Total Release (not including tritium, gases & alpha)	Ci	3.74E-06	4.29E-04	2.28E-03	2.81E-03	2.11E+01
2. Average diluted concentration for the Period	µCi/ mL	8.02E-15	6.46E-13	3.56E-12	4.36E-12	
3. Percent of applicable limit						
Total Body Dose	%	1.48E-03	1.03E-03	8.86E-03	1.09E-02	
Organ Dose	%	5.30E-04	4.37E-04	3.79E-03	3.81E-02	

B. Tritium						Est. Total Error %
1. Total Release	Ci	2.45E+00	8.47E-01	5.41E+00	9.28E-01	6.40E+00
2. Average diluted concentration for the Period	µCi/ mL	5.26E-09	1.28E-09	8.45E-09	1.44E-09	
3. Percent of applicable limit	%	5.26E-05	1.28E-05	8.45E-05	1.44E-05	

(10x 10CFR20 Limit of 1.00E-03 µCi/ mL; ODCMS 3.8.B.1.a)

C. Dissolved & Entrained Gases						Est. Total Error %
1. Total Release	Ci	2.42E-06	8.17E-04	5.97E-05	<LLD	2.11E+01
2. Average diluted concentration for the Period	µCi/ mL	5.20E-15	1.23E-12	9.32E-14	<LLD	
3. Percent of ODCM limit	%	2.60E-09	0.00E+00	4.66E-08	0.00E+00	

D. Gross Alpha Activity						Est. Total Error %
1. Total Release	Ci	<LLD	<LLD	<LLD	<LLD	2.30E+01

E. Volume of Waste Released (prior to dilution)	Liters	8.70E+07	8.68E+07	8.91E+07	9.06E+07

F. Volume of Dilution Water Used During Period	Liters	4.66E+11	6.64E+11	6.40E+11	6.44E+11

Abnormal and Normal Liquid Radioactive Releases

Period: January 1, 2012 through December 13, 2012

Unit: Peach Bottom

Nuclides Released		Continuous Mode				Batch Mode			
	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Sr-89	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-90	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137	Ci	<LLD	1.75E-05	1.32E-04	3.87E-05	3.35E-06	5.58E-07	<LLD	<LLD
I-131	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-58	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-60	Ci	<LLD	3.52E-04	1.53E-03	4.46E-04	<LLD	<LLD	1.02E-04	1.00E-03
Fe-59	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Zn-65	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54	Ci	<LLD	5.96E-05	1.95E-04	5.69E-05	1.67E-07	<LLD	<LLD	1.18E-03
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	1.67E-05	<LLD
Zr-95	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Nb-95	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Tc-99m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m	Ci	<LLD	<LLD	<LLD	<LLD	2.21E-07	<LLD	<LLD	<LLD
Fe-55	Ci	<LLD	<LLD	2.95E-04	8.62E-05	<LLD	<LLD	<LLD	<LLD
Sb-124	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	6.84E-06	<LLD
H-3	Ci	1.64E+00	8.47E-01	1.37E+00	9.21E-01	8.12E-01	3.86E-04	4.04E+00	6.63E-03
P-32	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	1.64E+00	8.47E-01	1.37E+00	9.21E-01	8.12E-01	3.87E-04	4.04E+00	8.81E-03
Kr-87	Ci	<LLD	8.17E-04	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-131m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	3.07E-05	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	1.86E-05	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	<LLD	2.42E-06	<LLD	1.04E-05	<LLD
Gross Alpha	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

Attachment 3: Solid Waste and Irradiated Fuel Shipments

Solid Waste Shipped Offsite for Burial or Disposal (Excluding irradiated fuel)

Estimate of major nuclide composition (by waste type)

1. Types of Waste	Total Quantity (m^3)	Total Activity (Ci)	Period	Est. Total Error (%)
a. Spent resin, filters, sludges, evaporator bottoms, etc.	9.26E+01	2.05E+02	2012	2.5E+01
b. Dry compressible waste, contaminated equipment, etc.	2.67E+03	5.79E+00	2012	2.5E+01
c. Irradiated components, control rods, etc.	N/A	N/A	2012	N/A
d. Other - oil	2.41E+01	2.17E-05	2012	2.5E+01

Spent resin, filters, sludges, evaporator bottoms, etc.

Major Nuclide Composition	Class "A" Waste		Major Nuclide Composition	Class "A" Waste	
	Ci	Percent		Ci	Percent
H-3	1.46E-02	7.11E-03	I-131	1.34E-27	6.53E-28
C-14	2.94E+00	1.43E+00	I-133	1.71E-88	8.34E-89
Na-22	8.35E-03	4.07E-03	Cs-134	5.11E-01	2.49E-01
Cr-51	2.87E-15	1.40E-15	Cs-137	1.97E+01	9.63E+00
Mn-54	5.52E+00	2.69E+00	Ba-140	1.11E-17	5.41E-18
Fe-55	3.69E+01	1.80E+01	La-140	8.52E-71	4.15E-71
Fe-59	1.15E-04	5.61E-05	Ce-141	3.76E-07	1.83E-07
Co-58	1.58E-01	7.70E-02	Ce-144	1.16E-01	5.66E-02
Co-60	1.24E+02	6.06E+01	Eu-152	1.19E-02	5.80E-03
Ni-63	3.29E+00	1.61E+00	Hf-175	5.94E-09	2.90E-09
Zn-65	1.04E+01	5.06E+00	Hf-181	2.61E-13	1.27E-13
Sr-89	1.46E-02	7.12E-03	Re-188	3.84E-88	1.87E-88
Sr-90	1.07E-01	5.22E-02	Au-199	9.18E-46	4.48E-46
Sr-92	1.43E-88	6.97E-89	Tl-208	4.13E-88	2.01E-88
Zr-95	2.14E-02	1.04E-02	Pb-214	1.30E-88	6.34E-89
Nb-95	1.48E-14	7.22E-15	Ra-226	1.09E-02	5.31E-03
Nb-97	7.16E-88	3.49E-88	Pu-238	1.93E-03	9.41E-04
Mo-99	2.03E-62	9.90E-63	Pu-241	2.98E-01	1.46E-01
Tc-99	1.02E-01	4.97E-02	Am-241	1.06E-03	5.15E-04
Ag-110m	5.29E-01	2.58E-01	Cm-242	1.73E-04	8.45E-05
Sb-124	8.94E-03	4.36E-03	Cm-243	2.99E-03	1.46E-03
Te-123m	4.01E-04	1.95E-04			
			Total	2.05E+02	1.00E+02

Dry compressible waste, contaminated equipment, etc.

Major Nuclide Composition	Class "A" Waste	
	Ci	Percent
C-14	3.10E-02	5.35E-01
Cr-51	6.76E-02	1.17E+00
Mn-54	3.32E-01	5.73E+00
Fe-55	1.37E+00	2.36E+01
Co-58	1.86E-02	3.21E-01
Co-60	3.02E+00	5.22E+01
Ni-63	6.00E-02	1.04E+00
Zn-65	5.81E-01	1.00E+01
Sr-89	2.25E-03	3.88E-02
Sr-90	2.38E-03	4.11E-02
Y-90	5.00E-04	8.63E-03
Tc-99	9.98E-04	1.72E-02
Ag-110m	1.12E-02	1.94E-01
Cs-134	6.94E-03	1.20E-01
Cs-137	2.51E-01	4.33E+00
Ba-137m	2.07E-02	3.57E-01
Ce-141	2.61E-03	4.51E-02
Ce-144	1.06E-02	1.82E-01
Pu-238	1.82E-05	3.14E-04
Pu-241	2.89E-03	4.99E-02
Am-241	1.01E-05	1.74E-04
Cm-242	6.76E-06	1.17E-04
Cm-243	2.87E-05	4.95E-04
Total	5.79E+00	1.00E+02

Irradiated components, control rods, etc.

No Irradiated components (e.g. control rod blades, etc.) shipped.

Other - Oil

Major Nuclide Composition	Class "A" Waste	
	Ci	Percent
Co-60	1.23E-06	5.67E+00
Ni-63	1.22E-05	5.62E+01
Cs-137	1.12E-06	5.16E+00
Ce-144	7.14E-06	3.29E+01
Total	2.17E-05	1.00E+02

Irradiated Fuel Shipments (Disposition)

No shipment of irradiated fuel was made during the reporting period of 2012.

Changes to Process Control Program (PCP)

Submitted with this report is Revision 8 of RW-AA-100 (Appendix C), Process Control Program for Radioactive Wastes. All changes made to the document are denoted by "Revision Bars" in the right hand margin. The following is a summary of the significant changes made in Revision 8:

- Step 4.1.8 was added to allow an Exelon Nuclear plant to store waste from another Exelon Nuclear plant provided formal NRC approval is granted for the transfer of waste. The addition of this procedural step for the transfer and storage of radioactive waste at an Exelon Nuclear plant from another Exelon Nuclear plant to the Process Control Program ensures that if the storage of water from another site is implemented, that a formal NRC review and approval process for the storage of waste from another site will address the site specific effects on the UFSAR and regulatory bases.

- Step 4.2.8 was modified to add "in the pool or loading the processed activated hardware into the Dry Cask storage system." to further clarify the storage of activated hardware. The additional wording has been added to clarify the storage of activated hardware are generic and remain consistent with the UFSAR description of the Spent fuel Pool and Dry Cask Storage Systems.

- Step 4.4.4 was added to state that, "Shipments sent for offsite storage SHALL meet the storage site's waste acceptance criteria." The addition of this procedural step for the transfer and storage of radioactive waste at an Exelon Nuclear plant from another Exelon Nuclear plant to the Process Control Program ensures that if the storage of waste from another site is implemented, that a formal NRC review and approval process for the storage of waste from another site will address the site specific effects on the UFSAR and regulatory bases.

- Numerous minor wording and editorial changes were made throughout the document to correct grammatical errors and to improve document readability.

Attachment 4: Radiological Impact on Man

Radiological Impact on Individual Members of the Public

The following table is a summary of gaseous and liquid radiation annual doses to MEMBERS OF THE PUBLIC as calculated by the ODCM. Direct Radiation as measured by dosimetry, as required by the ODCM, is also provided in Table 7.

Table 7. Radiological Impact on Man and 40 CFR 190 Compliance Summary

Effluent	Applicable Organ	Estimated Dose	Age Group	Location		% of Applicable Limit	Limit	Unit
				Distance (meters)	Direction (toward)			
Noble Gas	Gamma - Air Dose	2.32E-01	All	1.10E+03	SSE	1.16E+00	2.00E+01	mrad
Noble Gas	Beta - Air Dose	1.58E-01	All	1.10E+03	SSE	3.95E-01	4.00E+01	mrad
Noble Gas	Total Body (gamma)	2.24E-01	All	1.10E+03	SSE	2.24E+00	1.00E+01	mrem
Noble Gas	Skin (Beta)	2.92E-01	All	1.10E+03	SSE	9.73E-01	3.00E+01	mrem
Gaseous Iodine, Particulate, Carbon-14 & Tritium	Bone	5.49E-01	Child	1.10E+03	SSE	1.83E+00	3.00E+01	mrem
Gaseous Iodine, Particulate, Carbon-14 & Tritium	Thyroid	7.32E-02	Infant	1.10E+03	SSE	2.44E-01	3.00E+01	mrem
Liquid	Total Body (gamma)	3.36E-04	Child	Site Boundary		5.60E-03	6.00E+00	mrem
Liquid	GI-LLI	3.78E-03	Adult			1.89E-02	2.00E+01	mrem
Direct Radiation	Total Body	1.55E+00	All	1.15E+03	SSE	7.05E+00	2.20E+01	mrem
40 CFR Part 190 Compliance								
Total Dose	Total Body	1.77E+00	All	1.15E+03	SSE	7.10E+00	2.50E+01	mrem
Total Dose	Thyroid	1.62E+00	All	1.15E+03	SSE	2.16E+00	7.50E+01	mrem
Total Dose	Bone	2.10E+00	All	1.15E+03	SSE	8.40E+00	2.50E+01	mrem
Total Dose	Total Body	2.24E-01	All	1.15E+03	SSE	7.48E+00	3.00E+00	mrem
Total Dose	Bone	5.49E-01	All	1.15E+03	SSE	1.83E+01	3.00E+00	mrem
Total Dose	Thyroid	3.05E-01	All	1.15E+03	SSE	5.55E-01	5.50E+01	mrem

40 CFR 190 Dose Projection

The annual dose equivalent to a real individual who is located beyond the SITE BOUNDARY from all uranium fuel cycle sources within 8 kilometers were well below limits.

Liquid and Gaseous Effluent Radiation Monitors and Instrumentation

No effluent radiation monitors and instrumentation were unavailable for periods beyond the requirements of the ODCM.

Attachment 5: Meteorological Data

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Extremely Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	11	0	0	0	0	11
NE	1	4	0	0	0	0	5
ENE	3	10	0	0	0	0	13
E	0	9	0	0	0	0	9
ESE	0	7	4	0	0	0	11
SE	0	2	0	0	0	0	2
SSE	0	0	5	2	0	0	7
S	0	0	5	1	0	0	6
SSW	0	0	0	0	1	0	1
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	1	0	0	0	0	1
NNW	0	1	0	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	4	45	14	3	1	0	67

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Moderately Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	4	0	0	0	0	4
NNE	0	6	0	0	0	0	6
NE	4	0	0	0	0	0	4
ENE	2	1	0	0	0	0	3
E	1	7	0	0	0	0	8
ESE	0	3	1	0	0	0	4
SE	1	2	2	0	0	0	5
SSE	0	0	3	1	0	0	4
S	0	0	21	6	0	0	27
SSW	0	0	4	3	0	0	7
SW	0	2	4	2	0	0	8
WSW	0	0	1	0	0	0	1
W	0	0	5	1	0	0	6
WNW	0	0	1	0	0	0	1
NW	0	1	4	2	0	0	7
NNW	0	0	3	0	3	0	6
Variable	0	0	0	0	0	0	0
Total	8	26	49	15	3	0	101

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Slightly Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	4	0	0	0	0	5
NNE	1	5	0	0	0	0	6
NE	5	1	0	0	0	0	6
ENE	1	0	0	0	0	0	1
E	2	1	0	0	0	0	3
ESE	1	2	1	0	0	0	4
SE	0	0	0	0	0	0	0
SSE	0	2	1	2	0	0	5
S	0	1	5	0	0	0	6
SSW	0	1	1	0	0	0	2
SW	0	0	2	1	0	0	3
WSW	0	1	2	0	0	0	3
W	0	1	14	2	5	0	22
WNW	0	1	7	6	0	0	14
NW	0	2	19	16	0	0	37
NNW	0	2	16	3	3	0	24
Variable	0	0	0	0	0	0	0
Total	11	24	68	30	8	0	141

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Neutral - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	9	30	11	0	0	0	50
NNE	11	30	0	0	0	0	41
NE	26	11	0	0	0	0	37
ENE	38	20	0	0	0	0	58
E	17	37	0	0	0	0	54
ESE	2	12	6	0	0	0	20
SE	3	21	11	0	0	0	35
SSE	5	31	11	6	0	0	53
S	1	30	19	2	0	0	52
SSW	1	8	8	3	0	0	20
SW	1	7	9	1	0	0	18
WSW	1	15	16	7	3	0	42
W	1	20	52	49	5	0	127
WNW	6	33	67	15	1	0	122
NW	3	29	71	24	0	0	127
NNW	9	27	61	11	3	0	111
Variable	0	0	0	0	0	0	0
Total	134	361	342	118	12	0	967

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 10
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Slightly Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	8	1	0	0	0	0	9
NNE	15	2	1	0	0	0	18
NE	14	1	0	0	0	0	15
ENE	26	4	0	0	0	0	30
E	31	21	0	0	0	0	52
ESE	32	10	0	0	0	0	42
SE	24	28	1	0	0	0	53
SSE	19	37	12	0	0	0	68
S	9	24	9	2	0	0	44
SSW	10	15	7	5	0	0	37
SW	14	19	1	0	0	0	34
WSW	8	28	5	0	0	0	41
W	15	42	22	0	0	0	79
WNW	11	32	10	0	0	0	53
NW	13	16	8	0	0	0	37
NNW	7	25	3	0	0	0	35
Variable	1	0	0	0	0	0	1
Total	257	305	79	7	0	0	648

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Moderately Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	5	0	0	0	0	0	5
NNE	2	0	0	0	0	0	2
NE	8	0	0	0	0	0	8
ENE	10	0	0	0	0	0	10
E	17	0	0	0	0	0	17
ESE	4	2	0	0	0	0	6
SE	7	0	0	0	0	0	7
SSE	4	2	0	0	0	0	6
S	4	1	1	0	0	0	6
SSW	6	2	0	0	0	0	8
SW	5	0	0	0	0	0	5
WSW	17	8	2	0	0	0	27
W	21	7	1	0	0	0	29
WNW	9	3	0	0	0	0	12
NW	12	2	0	0	0	0	14
NNW	9	1	0	0	0	0	10
Variable	0	0	0	0	0	0	0
Total	140	28	4	0	0	0	172

Hours of calm in this stability class: 2
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Extremely Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	0	0	0	0	0	2
NNE	8	0	0	0	0	0	8
NE	4	0	0	0	0	0	4
ENE	7	0	0	0	0	0	7
E	4	0	0	0	0	0	4
ESE	3	1	0	0	0	0	4
SE	3	0	0	0	0	0	3
SSE	2	0	0	0	0	0	2
S	0	0	0	0	0	0	0
SSW	0	1	0	0	0	0	1
SW	4	0	0	0	0	0	4
WSW	8	1	0	0	0	0	9
W	8	2	0	0	0	0	10
WNW	6	0	0	0	0	0	6
NW	4	0	0	0	0	0	4
NNW	3	1	0	0	0	0	4
Variable	1	0	0	0	0	0	1
Total	67	6	0	0	0	0	73

Hours of calm in this stability class: 2
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Extremely Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	2	0	0	0	2
NE	0	1	0	0	0	0	1
ENE	0	0	0	0	0	0	0
E	0	5	0	0	0	0	5
ESE	0	2	5	0	0	0	7
SE	0	0	0	3	0	0	3
SSE	0	0	1	0	0	0	1
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	8	8	3	0	0	19

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Moderately Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	2	1	0	0	0	3
NE	0	1	0	0	0	0	1
ENE	0	2	0	0	0	0	2
E	0	1	1	0	0	0	2
ESE	0	1	0	0	0	0	1
SE	0	0	3	2	0	0	5
SSE	0	0	0	1	0	0	1
S	0	0	6	11	0	0	17
SSW	0	0	2	1	0	3	6
SW	0	0	0	1	1	0	2
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	1	1
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	7	13	16	1	4	41

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Slightly Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	1	0	0	0	0	1
NNE	0	1	1	0	0	0	2
NE	0	0	5	0	0	0	5
ENE	1	3	0	0	0	0	4
E	1	1	0	0	0	0	2
ESE	0	0	2	0	0	0	2
SE	0	0	7	2	0	0	9
SSE	0	0	4	2	3	0	9
S	0	0	7	4	2	0	13
SSW	0	0	6	2	1	1	10
SW	0	0	1	3	2	0	6
WSW	0	0	0	2	1	0	3
W	0	0	1	9	2	2	14
WNW	0	0	1	2	2	0	5
NW	0	1	2	5	6	0	14
NNW	0	0	6	4	0	7	17
Variable	0	0	0	0	0	0	0
Total	2	7	43	35	19	10	116

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Neutral - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	18	29	20	5	0	74
NNE	5	9	33	3	0	0	50
NE	6	18	14	2	0	0	40
ENE	8	18	14	2	0	0	42
E	4	22	27	18	3	0	74
ESE	5	16	23	18	2	0	64
SE	2	11	32	16	1	0	62
SSE	1	8	20	6	4	0	39
S	1	13	45	37	10	0	106
SSW	0	5	14	13	7	3	42
SW	0	5	10	13	1	0	29
WSW	0	6	11	17	4	8	46
W	0	6	19	50	42	35	152
WNW	1	4	17	70	34	14	140
NW	0	13	50	74	49	10	196
NNW	2	11	37	45	10	3	108
Variable	0	0	0	0	0	0	0
Total	37	183	395	404	172	73	1264

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Slightly Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	3	9	11	1	0	0	24
NNE	0	8	4	0	1	0	13
NE	0	5	4	0	0	0	9
ENE	4	10	2	0	0	0	16
E	3	9	3	1	0	0	16
ESE	2	8	8	2	0	0	20
SE	3	18	23	4	0	0	48
SSE	0	18	24	12	0	0	54
S	3	16	38	26	4	0	87
SSW	2	6	9	21	5	0	43
SW	1	5	10	17	2	0	35
WSW	0	8	18	7	3	0	36
W	1	1	11	25	9	0	47
WNW	1	4	7	14	4	0	30
NW	0	4	23	15	4	0	46
NNW	0	5	11	4	0	0	20
Variable	0	0	0	0	0	0	0
Total	23	134	206	149	32	0	544

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Moderately Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	3	0	0	0	0	5
NNE	1	1	1	0	0	0	3
NE	0	0	1	0	0	0	1
ENE	1	3	0	0	0	0	4
E	1	4	2	0	0	0	7
ESE	0	3	4	0	0	0	7
SE	1	2	3	0	0	0	6
SSE	2	3	0	1	0	0	6
S	1	9	7	0	0	0	17
SSW	4	3	8	2	0	0	17
SW	2	1	10	6	0	0	19
WSW	1	4	5	2	1	0	13
W	1	7	4	7	2	0	21
WNW	3	1	0	3	0	0	7
NW	1	1	2	1	0	0	5
NNW	2	2	2	0	0	0	6
Variable	0	0	0	0	0	0	0
Total	23	47	49	22	3	0	144

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: January - March 2012
Stability Class - Extremely Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	1	0	0	0	0	0	1
ESE	0	1	0	0	0	0	1
SE	0	2	3	0	0	0	5
SSE	0	1	1	0	0	0	2
S	0	1	0	0	0	0	1
SSW	0	2	3	0	0	0	5
SW	0	2	12	2	0	0	16
WSW	0	0	5	2	0	0	7
W	1	1	0	6	0	0	8
WNW	1	0	2	0	0	0	3
NW	0	0	3	0	0	0	3
NNW	0	0	3	0	0	0	3
Variable	0	0	0	0	0	0	0
Total	3	10	32	10	0	0	55

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 1

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Extremely Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	22	0	0	0	0	24
NNE	8	8	0	0	0	0	16
NE	6	7	0	0	0	0	13
ENE	12	3	0	0	0	0	15
E	7	19	0	0	0	0	26
ESE	2	12	4	0	0	0	18
SE	0	15	7	0	0	0	22
SSE	0	2	5	0	0	0	7
S	0	0	2	1	0	0	3
SSW	0	0	0	0	0	0	0
SW	0	1	1	2	0	0	4
WSW	0	1	0	1	0	0	2
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	2	0	0	0	2
NNW	0	6	0	0	0	0	6
Variable	0	0	0	0	0	0	0
Total	37	96	21	4	0	0	158

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Moderately Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	4	10	0	0	0	0	14
NNE	6	5	1	0	0	0	12
NE	6	0	0	0	0	0	6
ENE	8	0	0	0	0	0	8
E	7	2	0	0	0	0	9
ESE	3	6	1	0	0	0	10
SE	0	4	1	0	0	0	5
SSE	0	6	6	0	0	0	12
S	0	2	6	0	0	0	8
SSW	0	0	2	0	0	0	2
SW	0	0	5	1	0	0	6
WSW	0	4	0	1	0	0	5
W	0	3	12	3	0	0	18
WNW	0	5	9	8	1	0	23
NW	0	10	13	13	0	0	36
NNW	0	12	25	10	0	0	47
Variable	0	0	0	0	0	0	0
Total	34	69	81	36	1	0	221

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Slightly Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	5	2	0	0	0	9
NNE	2	1	0	0	0	0	3
NE	5	1	0	0	0	0	6
ENE	2	0	0	0	0	0	2
E	2	1	0	0	0	0	3
ESE	3	1	0	0	0	0	4
SE	0	3	1	0	0	0	4
SSE	0	6	3	1	0	0	10
S	0	1	0	0	0	0	1
SSW	0	1	3	0	0	0	4
SW	0	0	0	0	0	0	0
WSW	0	2	5	0	0	0	7
W	1	1	7	2	0	0	11
WNW	0	1	3	3	0	0	7
NW	0	3	21	9	0	0	33
NNW	2	14	21	6	0	0	43
Variable	0	0	0	0	0	0	0
Total	19	41	66	21	0	0	147

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Neutral - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	23	25	20	3	0	0	71
NNE	15	5	1	0	0	0	21
NE	15	0	0	0	0	0	15
ENE	32	1	0	0	0	0	33
E	15	8	0	0	0	0	23
ESE	11	18	2	0	0	0	31
SE	6	62	27	0	0	0	95
SSE	12	58	21	0	0	0	91
S	8	14	6	1	0	0	29
SSW	4	12	2	0	0	0	18
SW	4	8	6	0	0	0	18
WSW	1	13	8	1	0	0	23
W	6	14	13	7	0	0	40
WNW	9	21	25	1	0	0	56
NW	10	16	44	9	0	0	79
NNW	9	40	50	13	0	0	112
Variable	0	0	0	0	0	0	0
Total	180	315	225	35	0	0	755

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Slightly Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	11	11	2	0	0	0	24
NNE	8	3	0	0	0	0	11
NE	11	0	0	0	0	0	11
ENE	24	0	0	0	0	0	24
E	18	4	0	0	0	0	22
ESE	17	6	1	0	0	0	24
SE	19	15	1	0	0	0	35
SSE	30	29	1	0	0	0	60
S	15	30	6	0	0	0	51
SSW	17	20	0	0	0	0	37
SW	15	18	2	0	0	0	35
WSW	14	24	5	0	0	0	43
W	23	48	13	0	0	0	84
WNW	11	34	12	0	0	0	57
NW	9	25	13	0	0	0	47
NNW	14	21	5	0	0	0	40
Variable	0	0	0	0	0	0	0
Total	256	288	61	0	0	0	605

Hours of calm in this stability class: 2
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Moderately Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	7	0	0	0	0	0	7
NNE	6	0	0	0	0	0	6
NE	7	0	0	0	0	0	7
ENE	7	0	0	0	0	0	7
E	4	0	0	0	0	0	4
ESE	11	0	0	0	0	0	11
SE	4	0	0	0	0	0	4
SSE	3	0	0	0	0	0	3
S	12	0	0	0	0	0	12
SSW	8	0	0	0	0	0	8
SW	15	3	0	0	0	0	18
WSW	18	19	0	0	0	0	37
W	14	25	3	0	0	0	42
WNW	9	9	1	0	0	0	19
NW	8	2	0	0	0	0	10
NNW	4	0	0	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	137	58	4	0	0	0	199

Hours of calm in this stability class: 3
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Extremely Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	0	0	0	0	0	1
NNE	1	0	0	0	0	0	1
NE	1	0	0	0	0	0	1
ENE	2	0	0	0	0	0	2
E	1	0	0	0	0	0	1
ESE	2	0	0	0	0	0	2
SE	1	0	0	0	0	0	1
SSE	0	0	0	0	0	0	0
S	1	0	0	0	0	0	1
SSW	3	0	0	0	0	0	3
SW	4	3	0	0	0	0	7
WSW	21	26	0	0	0	0	47
W	9	3	0	0	0	0	12
WNW	4	0	0	0	0	0	4
NW	1	0	0	0	0	0	1
NNW	2	0	0	0	0	0	2
Variable	0	0	0	0	0	0	0
Total	54	32	0	0	0	0	86

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Extremely Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	2	0	0	0	2
NNE	2	4	3	0	0	0	9
NE	0	6	3	1	0	0	10
ENE	2	13	7	1	0	0	23
E	2	9	3	0	0	0	14
ESE	0	13	12	3	1	2	31
SE	0	3	17	6	0	0	26
SSE	0	0	3	3	0	0	6
S	0	2	6	5	0	0	13
SSW	0	0	2	0	0	0	2
SW	0	1	3	2	0	0	6
WSW	0	0	1	0	0	0	1
W	0	0	0	0	0	0	0
WNW	0	2	0	6	0	0	8
NW	1	0	5	0	1	0	7
NNW	0	0	8	1	0	0	9
Variable	0	0	0	0	0	0	0
Total	7	53	75	28	2	2	167

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Moderately Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	2	2	0	0	0	4
NNE	0	0	5	0	0	0	5
NE	0	6	0	0	0	0	6
ENE	0	4	0	1	0	0	5
E	0	2	1	0	0	0	3
ESE	0	6	2	1	0	0	9
SE	0	1	2	2	0	0	5
SSE	0	2	1	0	0	0	3
S	0	1	2	1	0	0	4
SSW	0	1	1	0	0	0	2
SW	0	0	0	1	2	1	4
WSW	0	1	0	0	2	0	3
W	0	0	6	7	0	0	13
WNW	0	3	2	3	5	2	15
NW	0	2	4	8	7	0	21
NNW	0	2	10	6	1	0	19
Variable	0	0	0	0	0	0	0
Total	0	33	38	30	17	3	121

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Slightly Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	5	2	0	1	0	10
NNE	0	4	3	0	1	0	8
NE	1	7	1	0	0	0	9
ENE	0	3	1	0	0	0	4
E	0	1	4	2	0	0	7
ESE	0	3	7	1	1	1	13
SE	1	2	8	3	0	0	14
SSE	0	3	5	1	0	0	9
S	1	2	14	3	0	0	20
SSW	0	1	1	0	0	0	2
SW	1	0	2	2	0	0	5
WSW	0	0	4	3	0	0	7
W	0	0	3	6	5	0	14
WNW	0	2	3	10	8	2	25
NW	0	4	7	20	16	0	47
NNW	0	8	12	13	8	0	41
Variable	0	0	0	0	0	0	0
Total	6	45	77	64	40	3	235

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Neutral - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	3	6	18	30	13	1	71
NNE	3	6	12	3	0	0	24
NE	7	4	9	1	0	0	21
ENE	5	16	18	2	0	0	41
E	6	14	19	14	0	0	53
ESE	7	18	27	16	3	1	72
SE	4	17	54	20	0	0	95
SSE	5	13	42	21	2	0	83
S	3	23	45	24	4	0	99
SSW	2	12	15	1	2	0	32
SW	0	7	8	5	0	0	20
WSW	1	8	8	12	0	0	29
W	2	12	16	18	9	2	59
WNW	2	10	12	30	14	1	69
NW	1	10	29	41	22	4	107
NNW	2	20	34	25	17	3	101
Variable	0	0	0	0	0	0	0
Total	53	196	366	263	86	12	976

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Slightly Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	4	11	5	0	0	22
NNE	1	5	1	0	0	0	7
NE	1	1	5	2	0	0	9
ENE	1	4	3	0	0	0	8
E	1	4	5	3	0	0	13
ESE	1	3	2	0	0	0	6
SE	1	11	13	0	0	0	25
SSE	3	14	13	5	0	0	35
S	1	8	18	17	1	0	45
SSW	0	12	22	3	0	0	37
SW	1	8	16	9	1	0	35
WSW	2	8	17	16	0	0	43
W	0	11	9	14	2	0	36
WNW	0	9	11	23	10	0	53
NW	2	12	18	27	5	1	65
NNW	1	3	16	13	3	0	36
Variable	0	0	0	0	0	0	0
Total	18	117	180	137	22	1	475

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Moderately Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	3	2	1	0	0	0	6
NNE	1	4	2	0	0	0	7
NE	2	3	1	0	0	0	6
ENE	0	4	0	0	0	0	4
E	0	4	1	0	0	0	5
ESE	0	2	2	0	0	0	4
SE	0	1	0	0	0	0	1
SSE	0	1	0	0	0	0	1
S	0	4	3	0	0	0	7
SSW	1	6	12	0	0	0	19
SW	1	11	1	1	0	0	14
WSW	0	0	10	4	1	0	15
W	0	1	9	17	5	0	32
WNW	1	2	7	8	1	0	19
NW	1	2	17	3	0	0	23
NNW	1	5	2	2	0	0	10
Variable	0	0	0	0	0	0	0
Total	11	52	68	35	7	0	173

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: April - June 2012
Stability Class - Extremely Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	2	0	0	0	0	2
NNE	1	0	0	0	0	0	1
NE	1	1	1	0	0	0	3
ENE	0	0	0	0	0	0	0
E	1	0	0	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	1	0	0	0	0	1
SSE	0	1	0	0	0	0	1
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	1	4	0	0	0	5
WSW	0	0	0	0	0	0	0
W	0	0	5	3	0	0	8
WNW	0	0	2	0	0	0	2
NW	0	0	1	0	0	0	1
NNW	1	3	0	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	4	9	13	3	0	0	29

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 8

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Extremely Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	6	16	0	0	0	0	22
NNE	7	4	0	0	0	0	11
NE	10	5	0	0	0	0	15
ENE	5	2	0	0	0	0	7
E	3	2	0	0	0	0	5
ESE	2	6	0	0	0	0	8
SE	0	11	5	0	0	0	16
SSE	0	10	3	0	0	0	13
S	0	1	0	0	0	0	1
SSW	0	0	0	0	0	0	0
SW	0	2	1	0	0	0	3
WSW	0	1	0	0	0	0	1
W	0	1	0	0	0	0	1
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	3	4	0	0	0	0	7
Variable	0	0	0	0	0	0	0
Total	36	65	9	0	0	0	110

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 151

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Moderately Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	10	0	0	0	0	11
NNE	3	6	0	0	0	0	9
NE	9	2	0	0	0	0	11
ENE	10	1	0	0	0	0	11
E	1	2	0	0	0	0	3
ESE	2	0	0	0	0	0	2
SE	2	2	2	0	0	0	6
SSE	1	3	5	0	0	0	9
S	0	6	8	1	0	0	15
SSW	0	3	2	0	0	0	5
SW	1	1	6	0	0	0	8
WSW	0	5	1	0	0	0	6
W	0	3	6	0	0	0	9
WNW	0	7	1	0	0	0	8
NW	0	6	7	0	0	0	13
NNW	2	15	12	0	0	0	29
Variable	0	0	0	0	0	0	0
Total	32	72	50	1	0	0	155

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 2
Hours of missing stability measurements in all stability classes: 151

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Slightly Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	5	2	0	0	0	0	7
NNE	2	0	0	0	0	0	2
NE	2	0	0	0	0	0	2
ENE	3	0	0	0	0	0	3
E	2	1	0	0	0	0	3
ESE	0	0	0	0	0	0	0
SE	3	3	1	0	0	0	7
SSE	1	6	2	0	0	0	9
S	1	6	3	2	0	0	12
SSW	0	1	0	0	0	0	1
SW	0	2	2	0	0	0	4
WSW	0	3	1	0	0	0	4
W	0	5	0	0	0	0	5
WNW	1	4	1	0	0	0	6
NW	2	10	4	0	0	0	16
NNW	0	16	10	0	0	0	26
Variable	0	0	0	0	0	0	0
Total	22	59	24	2	0	0	107

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 2
Hours of missing stability measurements in all stability classes: 151

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Neutral - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	25	34	0	0	0	0	59
NNE	27	4	0	0	0	0	31
NE	24	1	0	0	0	0	25
ENE	19	0	0	0	0	0	19
E	12	0	1	0	0	0	13
ESE	4	0	0	0	0	0	4
SE	7	23	5	0	0	0	35
SSE	7	43	7	3	0	0	60
S	6	22	4	0	0	0	32
SSW	6	15	5	0	0	0	26
SW	11	19	10	0	0	0	40
WSW	9	15	7	0	0	0	31
W	5	21	7	0	0	0	33
WNW	6	10	0	0	0	0	16
NW	15	37	13	0	0	0	65
NNW	19	41	24	1	0	0	85
Variable	0	0	0	0	0	0	0
Total	202	285	83	4	0	0	574

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 3
Hours of missing stability measurements in all stability classes: 151

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Slightly Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	20	7	1	0	0	0	28
NNE	16	0	0	0	0	0	16
NE	14	1	0	0	0	0	15
ENE	4	0	0	0	0	0	4
E	12	1	0	0	0	0	13
ESE	7	1	0	0	0	0	8
SE	11	18	2	0	0	0	31
SSE	11	71	6	3	0	0	91
S	22	37	2	1	1	0	63
SSW	24	17	1	0	0	0	42
SW	28	30	2	0	0	0	60
WSW	27	35	2	0	0	0	64
W	22	35	1	0	0	0	58
WNW	26	58	3	0	0	0	87
NW	20	29	7	0	0	0	56
NNW	22	15	8	0	0	0	45
Variable	1	0	0	0	0	0	1
Total	287	355	35	4	1	0	682

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 9
Hours of missing stability measurements in all stability classes: 151

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Moderately Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	3	0	0	0	0	0	3
NNE	2	0	0	0	0	0	2
NE	1	0	0	0	0	0	1
ENE	3	0	0	0	0	0	3
E	1	0	0	0	0	0	1
ESE	1	1	0	0	0	0	2
SE	2	1	0	0	0	0	3
SSE	2	0	0	0	0	0	2
S	11	6	1	0	0	0	18
SSW	11	7	0	0	0	0	18
SW	33	11	0	0	0	0	44
WSW	39	10	0	0	0	0	49
W	28	21	0	0	0	0	49
WNW	18	9	0	0	0	0	27
NW	11	12	0	0	0	0	23
NNW	1	1	0	0	0	0	2
Variable	0	0	0	0	0	0	0
Total	167	79	1	0	0	0	247

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 5
Hours of missing stability measurements in all stability classes: 151

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Extremely Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	1	0	0	0	0	0	1
S	1	0	0	0	0	0	1
SSW	4	0	0	0	0	0	4
SW	23	18	1	0	0	0	42
WSW	40	33	0	0	0	0	73
W	13	20	0	0	0	0	33
WNW	3	1	0	0	0	0	4
NW	3	0	0	0	0	0	3
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	88	72	1	0	0	0	161

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 151

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Extremely Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	5	3	0	0	0	8
NNE	0	2	0	0	0	0	2
NE	0	5	2	0	0	0	7
ENE	0	9	0	0	0	0	9
E	0	11	3	1	0	0	15
ESE	0	6	12	0	0	0	18
SE	0	2	8	3	0	0	13
SSE	0	0	2	0	0	0	2
S	0	0	2	0	0	0	2
SSW	0	0	1	1	0	0	2
SW	0	0	3	3	0	0	6
WSW	0	1	0	0	0	0	1
W	0	0	0	1	1	0	2
WNW	0	1	2	1	0	0	4
NW	0	1	0	0	0	0	1
NNW	0	2	0	0	0	0	2
Variable	0	0	0	0	0	0	0
Total	0	45	38	10	1	0	94

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 83

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Moderately Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	5	2	0	0	0	7
NNE	0	4	0	0	0	0	4
NE	0	2	4	0	0	0	6
ENE	2	3	0	0	0	0	5
E	1	7	2	0	0	0	10
ESE	0	5	0	1	0	0	6
SE	0	0	5	0	0	0	5
SSE	0	0	2	0	0	0	2
S	0	3	3	2	0	0	8
SSW	0	1	4	2	0	0	7
SW	0	1	4	0	0	0	5
WSW	0	2	0	0	0	0	2
W	0	0	6	4	0	0	10
WNW	0	0	1	0	0	0	1
NW	0	0	0	6	1	0	7
NNW	0	2	2	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	3	35	35	15	1	0	89

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 83

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Slightly Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	6	2	0	0	0	9
NNE	1	2	0	0	0	0	3
NE	0	1	1	0	0	0	2
ENE	1	3	0	0	0	0	4
E	6	4	3	0	0	0	13
ESE	1	3	1	1	0	0	6
SE	2	3	4	1	0	0	10
SSE	0	3	1	1	0	0	5
S	0	3	14	5	2	0	24
SSW	0	3	6	2	0	0	11
SW	0	3	8	4	0	0	15
WSW	0	0	5	0	0	0	5
W	0	3	2	3	0	0	8
WNW	0	4	8	1	0	0	13
NW	0	2	10	16	1	0	29
NNW	1	7	18	6	0	0	32
Variable	0	0	0	0	0	0	0
Total	13	50	83	40	3	0	189

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 3
Hours of missing stability measurements in all stability classes: 83

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Neutral - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	11	8	3	4	0	28
NNE	3	5	11	0	0	0	19
NE	9	12	12	0	0	0	33
ENE	10	12	19	2	0	0	43
E	12	21	28	12	0	0	73
ESE	3	9	15	6	0	0	33
SE	4	18	19	6	1	0	48
SSE	3	17	28	17	2	2	69
S	3	6	44	20	2	4	79
SSW	0	13	24	4	1	0	42
SW	5	13	21	12	0	0	51
WSW	1	15	13	4	0	0	33
W	2	12	21	8	1	0	44
WNW	3	11	7	3	0	0	24
NW	4	21	48	21	7	0	101
NNW	4	27	32	15	3	0	81
Variable	0	0	0	0	0	0	0
Total	68	223	350	133	21	6	801

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 7
Hours of missing stability measurements in all stability classes: 83

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Slightly Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	18	11	4	0	0	34
NNE	8	9	7	0	0	0	24
NE	3	10	1	0	0	0	14
ENE	3	13	0	0	0	0	16
E	4	5	2	0	0	0	11
ESE	3	6	4	2	1	0	16
SE	8	24	16	3	0	0	51
SSE	5	13	22	17	0	0	57
S	4	4	20	34	0	0	62
SSW	1	6	20	13	0	0	40
SW	3	12	22	16	0	0	53
WSW	5	8	16	19	2	0	50
W	2	10	11	3	0	0	26
WNW	3	11	19	9	2	0	44
NW	2	8	22	36	7	0	75
NNW	4	9	18	8	0	0	39
Variable	0	0	0	0	0	0	0
Total	59	166	211	164	12	0	612

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 11
Hours of missing stability measurements in all stability classes: 83

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Moderately Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	4	6	0	0	0	12
NNE	0	1	2	0	0	0	3
NE	3	2	0	0	0	0	5
ENE	4	13	0	0	0	0	17
E	1	3	0	0	0	0	4
ESE	2	1	0	0	0	0	3
SE	2	8	1	0	0	0	11
SSE	3	14	3	2	0	0	22
S	4	10	7	0	1	0	22
SSW	4	10	7	4	0	0	25
SW	5	10	2	4	0	0	21
WSW	3	7	3	6	0	0	19
W	4	4	2	3	0	0	13
WNW	5	3	8	1	0	0	17
NW	2	5	19	6	0	0	32
NNW	0	9	13	5	0	0	27
Variable	0	0	0	0	0	0	0
Total	44	104	73	31	1	0	253

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 83

Peach Bottom Nuclear Station

Period of Record: July - September 2012
Stability Class - Extremely Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	2	0	0	0	0	3
NNE	1	3	0	0	0	0	4
NE	5	3	0	0	0	0	8
ENE	1	0	0	0	0	0	1
E	1	0	0	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	1	0	0	0	0	1
S	1	3	0	0	0	0	4
SSW	2	1	1	0	0	0	4
SW	3	4	1	0	0	0	8
WSW	1	4	3	1	0	0	9
W	1	2	4	1	0	0	8
WNW	1	0	2	1	0	0	4
NW	1	1	5	0	0	0	7
NNW	0	2	2	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	19	26	18	3	0	0	66

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 83

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Extremely Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	1	0	0	0	0	0	1
NE	2	0	0	0	0	0	2
ENE	4	0	0	0	0	0	4
E	2	4	0	0	0	0	6
ESE	0	5	1	0	0	0	6
SE	0	1	1	0	0	0	2
SSE	0	2	0	0	0	0	2
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	9	12	2	0	0	0	23

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 9

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Moderately Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	1	3	0	0	0	0	4
NE	3	0	0	0	0	0	3
ENE	5	1	0	0	0	0	6
E	4	0	0	0	0	0	4
ESE	0	2	0	0	0	0	2
SE	0	2	0	0	0	0	2
SSE	0	0	0	0	0	0	0
S	0	1	1	0	0	0	2
SSW	0	0	2	0	0	0	2
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	1	0	0	1
Variable	0	0	0	0	0	0	0
Total	13	9	3	1	0	0	26

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 9

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Slightly Unstable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	1	0	0	0	1
NNE	0	2	0	0	0	0	2
NE	3	0	0	0	0	0	3
ENE	4	0	0	0	0	0	4
E	6	0	0	0	0	0	6
ESE	0	0	0	0	0	0	0
SE	0	1	1	0	0	0	2
SSE	0	1	1	0	0	0	2
S	0	1	3	0	0	0	4
SSW	0	0	1	0	0	0	1
SW	0	0	0	0	0	0	0
WSW	0	2	1	0	0	0	3
W	0	0	1	0	0	0	1
WNW	0	1	0	0	0	0	1
NW	0	1	2	0	0	0	3
NNW	0	0	2	2	0	0	4
Variable	0	0	0	0	0	0	0
Total	13	9	13	2	0	0	37

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 9

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Neutral - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	13	32	13	0	0	0	58
NNE	16	40	10	0	0	0	66
NE	27	7	1	0	0	0	35
ENE	38	8	0	0	0	0	46
E	38	5	0	0	0	0	43
ESE	10	18	1	2	0	0	31
SE	1	15	4	0	1	0	21
SSE	1	15	8	1	0	0	25
S	3	13	5	2	0	0	23
SSW	0	9	3	0	0	0	12
SW	0	3	2	0	0	0	5
WSW	2	17	11	0	0	0	30
W	0	9	20	19	0	0	48
WNW	0	18	37	33	1	0	89
NW	4	24	63	35	5	0	131
NNW	2	29	69	16	0	0	116
Variable	0	0	0	0	0	0	0
Total	155	262	247	108	7	0	779

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 150
Hours of missing stability measurements in all stability classes: 9

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Slightly Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	35	26	5	0	0	0	66
NNE	24	16	7	1	0	0	48
NE	45	12	0	0	0	0	57
ENE	38	5	0	0	0	0	43
E	38	10	1	0	0	0	49
ESE	37	15	0	0	0	0	52
SE	24	19	1	0	0	0	44
SSE	16	20	6	0	0	0	42
S	22	24	4	0	0	0	50
SSW	12	9	1	0	0	0	22
SW	11	8	1	0	0	0	20
WSW	12	20	9	0	0	0	41
W	16	29	12	0	0	0	57
WNW	16	43	8	0	0	0	67
NW	19	36	11	0	0	0	66
NNW	17	58	7	2	0	0	84
Variable	0	0	0	0	0	0	0
Total	382	350	73	3	0	0	808

Hours of calm in this stability class: 10
Hours of missing wind measurements in this stability class: 23
Hours of missing stability measurements in all stability classes: 9

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Moderately Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	7	0	0	0	0	0	7
NNE	6	0	0	0	0	0	6
NE	7	0	0	0	0	0	7
ENE	4	0	0	0	0	0	4
E	16	0	0	0	0	0	16
ESE	14	1	0	0	0	0	15
SE	6	2	0	0	0	0	8
SSE	6	1	0	0	0	0	7
S	1	1	0	0	0	0	2
SSW	4	1	0	0	0	0	5
SW	7	3	0	0	0	0	10
WSW	16	10	1	0	0	0	27
W	24	16	0	0	0	0	40
WNW	33	7	0	0	0	0	40
NW	17	2	0	0	0	0	19
NNW	16	1	0	0	0	0	17
Variable	0	0	0	0	0	0	0
Total	184	45	1	0	0	0	230

Hours of calm in this stability class: 7
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 9

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Extremely Stable - 150Ft-33Ft Delta-T (F)
Winds Measured at 33 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	0	0	0	0	0	1
NNE	2	0	0	0	0	0	2
NE	2	0	0	0	0	0	2
ENE	2	0	0	0	0	0	2
E	4	0	0	0	0	0	4
ESE	4	1	0	0	0	0	5
SE	2	0	0	0	0	0	2
SSE	1	0	0	0	0	0	1
S	3	0	0	0	0	0	3
SSW	2	0	0	0	0	0	2
SW	4	1	0	0	0	0	5
WSW	12	7	0	0	0	0	19
W	20	4	0	0	0	0	24
WNW	22	0	0	0	0	0	22
NW	6	0	0	0	0	0	6
NNW	3	0	0	0	0	0	3
Variable	0	0	0	0	0	0	0
Total	90	13	0	0	0	0	103

Hours of calm in this stability class: 3
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 9

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Extremely Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	3	0	0	0	0	3
E	0	1	1	0	0	0	2
ESE	0	0	0	0	0	0	0
SE	0	1	2	1	1	0	5
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	1	0	0	0	1
W	0	0	0	0	0	0	0
WNW	0	0	2	4	0	0	6
NW	0	0	1	2	0	0	3
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	5	7	7	1	0	20

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 122

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Moderately Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	1	0	0	0	0	1
ENE	0	1	2	0	0	0	3
E	0	0	1	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	0	1	0	0	0	1
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	1	0	0	1
W	0	0	0	0	0	0	0
WNW	0	0	2	2	0	0	4
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	2	6	3	0	0	11

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 122

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Slightly Unstable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	1	0	0	0	1
NE	0	0	1	0	0	0	1
ENE	1	5	0	0	0	0	6
E	0	3	1	0	0	0	4
ESE	0	2	1	0	0	0	3
SE	0	0	0	1	0	0	1
SSE	0	1	1	1	0	0	3
S	0	0	0	2	0	0	2
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	2	0	1	0	0	3
W	0	0	0	1	0	0	1
WNW	0	0	3	1	0	0	4
NW	0	1	2	2	0	0	5
NNW	0	0	3	0	1	0	4
Variable	0	0	0	0	0	0	0
Total	1	14	13	9	1	0	38

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 3
Hours of missing stability measurements in all stability classes: 122

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Neutral - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	3	12	44	17	7	1	84
NNE	8	18	36	13	8	3	86
NE	6	19	21	11	3	0	60
ENE	3	38	15	7	1	0	64
E	5	29	15	1	0	1	51
ESE	0	23	19	12	1	3	58
SE	1	26	34	8	0	3	72
SSE	0	12	12	6	1	4	35
S	1	4	20	15	4	0	44
SSW	1	4	11	0	1	0	17
SW	0	0	10	2	0	0	12
WSW	0	5	16	6	5	1	33
W	1	3	17	13	19	8	61
WNW	0	2	21	26	31	39	119
NW	1	6	27	53	43	21	151
NNW	1	12	26	36	11	5	91
Variable	0	0	0	0	0	0	0
Total	31	213	344	226	135	89	1038

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 129
Hours of missing stability measurements in all stability classes: 122

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Slightly Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	11	24	14	0	0	51
NNE	2	14	14	1	0	1	32
NE	3	11	17	2	0	0	33
ENE	9	15	7	0	0	0	31
E	3	19	6	1	0	0	29
ESE	5	6	9	3	0	0	23
SE	1	21	22	0	0	0	44
SSE	0	11	15	5	0	0	31
S	2	7	23	6	0	0	38
SSW	1	0	31	4	0	0	36
SW	2	9	12	6	0	0	29
WSW	3	5	6	9	2	0	25
W	0	3	10	18	11	0	42
WNW	1	4	12	21	8	0	46
NW	1	3	16	25	1	4	50
NNW	2	9	16	8	0	1	36
Variable	0	0	0	0	0	0	0
Total	37	148	240	123	22	6	576

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 7
Hours of missing stability measurements in all stability classes: 122

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Moderately Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	6	3	0	0	0	9
NNE	2	6	5	0	0	0	13
NE	0	2	4	0	0	0	6
ENE	0	6	3	0	0	0	9
E	0	3	0	0	0	0	3
ESE	0	4	6	0	0	0	10
SE	1	4	7	0	0	0	12
SSE	2	2	2	0	0	0	6
S	1	5	3	1	0	0	10
SSW	1	1	8	3	0	0	13
SW	3	7	11	1	0	0	22
WSW	0	1	9	2	0	0	12
W	0	5	5	16	0	0	26
WNW	0	4	7	14	0	0	25
NW	0	5	3	0	0	0	8
NNW	2	2	4	0	0	0	8
Variable	0	0	0	0	0	0	0
Total	12	63	80	37	0	0	192

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 122

Peach Bottom Nuclear Station

Period of Record: October - December 2012
Stability Class - Extremely Stable - 316Ft-33Ft Delta-T (F)
Winds Measured at 320 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	2	3	0	0	0	6
NNE	0	3	4	0	0	0	7
NE	0	0	3	0	0	0	3
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	1	0	0	0	1
S	0	1	1	0	0	0	2
SSW	0	2	4	0	0	0	6
SW	0	4	0	0	0	0	4
WSW	0	8	4	1	0	0	13
W	0	3	1	0	0	0	4
WNW	2	6	3	3	0	0	14
NW	1	2	0	1	0	0	4
NNW	0	4	2	0	0	0	6
Variable	0	0	0	0	0	0	0
Total	4	35	26	5	0	0	70

Hours of calm in this stability class: 2
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 122

Appendix A: ERRATA Data Section

Recalculation of Noble Gas Doses from a Corrected Change to the ODCM

In 2009, Peach Bottom Atomic Power Station had approved and implemented a change to the Offsite Dose Calculation Manual (ODCM) involving a key parameter which was derived from meteorological conditions. This value, the 'ground-level noble gas dispersion factor' with symbol (X/Q), was changed without proper documentation and review of the available data could not validate that X/Q value.

Therefore, the noble gas doses from 2009, 2010 and 2011 were recalculated with the best-available number which is a 10-year highest annual average of the dispersion factor for the period 2002 to 2011. Note that no attempt was made to 'reconstruct' existing meteorology data because the 10-year average included this period and it is extremely unlikely that that 2009 and 2010 would vary greatly from the 10-year average.

Because the Annual Effluent Report combines the doses from elevated releases and ground-level releases, the following tables will also combine these doses.

Table 8. 2009 Effluent Report Revision

	Previously-reported dose	Revised dose	
Dose	(mrad)	(mrad)	Percent change
Gamma air	1.61E-01	3.34E-01	1.08E+02
Beta air	1.10E-01	2.30E-01	1.09E+02

Table 9. 2010 Effluent Report Revision

	Previously-reported dose	Revised dose	
Dose	(mrad)	(mrad)	Percent change
Gamma air	1.76E-01	3.49E-01	9.85E+01
Beta air	1.20E-01	2.38E-01	9.78E+01

Table 10. 2011 Effluent Report Revision

	Previously-reported dose	Revised dose	
Dose	(mrad)	(mrad)	Precent change
Gamma air	2.18E-01	2.65E-01	2.16E+01
Beta air	1.49E-01	1.82E-01	2.23E+01

The ground-level release mode is dominated by unidentified noble gases (~99%). Using the ODCM methodology, the doses for unidentified noble gases must use the most-limiting dose factor for that particular release mode. Therefore, as a result of unidentified noble gases alone, the dispersion factor changes are very pronounced and directly affect the dose rates calculated for both gamma air and beta air.

Appendix B: ODCM Revision

Offsite Dose Calculation Manual
Revision 14

Peach Bottom Atomic Power Station
Units 2 and 3

16NOV12

Exelon Generation Company, LLC
Docket Nos. 50-277 & 50-278

PORC Approval: 11/15/2012 M5# 12-36
PORC Chairman/ Date/ PORC Meeting#

Implemented:
Plant Manager

Table of Contents

I. Purpose

The purpose of the Offsite Dose Calculation Manual is to establish methodologies and procedures for calculating doses to individuals in areas at and beyond the SITE BOUNDARY due to radioactive effluents from Peach Bottom Atomic Power Station. The results of these calculations are required to determine compliance with the requirements of Specification 5.5.4, "Radioactive Effluent Controls Program" of Appendix A to Operating Licenses DPR-44 and DPR-56, "Technical Specifications for Peach Bottom Atomic Power Station Units No. 2 and 3". The Radioactive Effluents Control Program is located in Appendix A of this Offsite Dose Calculation Manual and contains Offsite Dose Calculation Manual Specifications (ODCMS) and their associated Bases which implement the requirements of Technical Specification 5.5.4.

II. Setpoint Determination for Liquid & Gaseous Monitors

II.A Liquid Radwaste Activity Monitor Setpoint

A sketch of the Liquid Radwaste System is presented in Figure 4. Each tank of radioactive waste is sampled prior to release. A small liquid volume of this sample is analyzed for gross gamma activity in a NaI well counter. This NaI well counter activity is then converted to an equivalent liquid radwaste monitor reading.

CPS (R/W Monitor) = [Net CPM/ml (well) x Eff W/RW] + Background CPS

Where:

CPS (R/W Monitor)	=	liquid radwaste gross activity monitor reading in CPS
Net CPM/ml (well)	=	gross gamma activity for the radwaste sample tank [determined by the well counter]
Eff W/RW	=	conversion factor between well counter and liquid radwaste gross activity monitor [determined by calibrating both detectors with the same liquid radioactive source]
Background CPS	=	background reading of the liquid radwaste gross activity monitor in CPS

Exceeding the expected response would indicate that an incorrect sample had been obtained for that release and the release is automatically stopped.

The alarm and trip pot setpoints for the liquid radwaste activity monitor are determined from a calibration curve for the alarm pot and trip pot. The alarm pot setting includes a factor of 1.25 to allow for analysis error, pot setting error, instrument error and calibration error. The trip pot setting includes a factor of 1.35 to allow for analysis error, pot setting error, instrument error and calibration error.

II.B Liquid Radwaste Release Flowrate Setpoint Determination

The trip pot setpoint for the liquid radwaste release flowrate is determined by multiplying the liquid radwaste flowrate (from Section III.A) by 1.2 and using this value on the appropriate calibration curve for the discharge flow meter to be used. The Peach Bottom radwaste system has two flow monitors - high flow (5 to 300 gpm) and low flow (0.8 to 15 gpm). The factor of 1.2 allows for pot setting error and instrument error. The flow rate determination includes a margin of assurance which includes consideration of this error such that the instantaneous release limit of 10 CFR 20 is not exceeded.

II.C Setpoint Determination for Gaseous Radwaste

A sketch of the Offgas Radwaste Treatment System is presented in Figure 2. Sketches of the Ventilation Treatment Systems for Units 2 and 3 are presented in Figures 3 and 4 respectively. The high and high-high alarm setpoints for the main stack radiation monitor, Unit 2 roof vent radiation monitor and Unit 3 roof vent radiation monitor are determined as follows:

High Alarm - the high alarm setpoint is set at approximately 3 x background.

High-High Alarm - the high-high alarm setpoint is set at a release rate from this vent of approximately 30% of the instantaneous release limit as specified in ODCMS 3.8.C.1.a for the most restrictive case (skin or total body) on an unidentified basis. To determine these setpoints, solve the gaseous effluent dose rate equations in section IV.A of the ODCM to determine what main stack release rate and roof vent release rate will produce a dose rate of 150 mrem/yr to the total body (30% of the limit of 500 mrem/yr) and a dose rate of 900 mrem/yr to the skin (30% of the limit of 3000 mrem/yr) from each release point. Using the highest (most restrictive) release rate for each release point determine monitor response required to produce this release rate assuming a normal vent flow rate and pressure correction factor. Set the high-high alarm for approximately this monitor response.

II.D. Setpoint Determination for Gaseous Radwaste

Flow Monitors

The alarm setpoint for the main stack flow monitor is as follows:

Low Flow Alarm - 10,000 CFM. - This setting ensures that the main stack minimum dilution flow as specified in ODCMS 3.8.C.4.a is maintained.

The alarm setpoints for the roof vent flow monitors are as follows:

Low Flow Alarm - 1.5×10^5 cfm

High Flow Alarm - 5.4×10^5 cfm

III. Liquid Pathway Dose Calculations

III.A Liquid Radwaste Release Flow Rate Determination

Peach Bottom Atomic Power Station Units 2 and 3 have one common discharge point for liquid releases. The following calculation assures that the radwaste release limits are met.

The flow rate of liquid radwaste released from the site to areas at and beyond the SITE BOUNDARY shall be such that the concentration of radioactive material after dilution shall be limited to 10 times the concentration specified in 10 CFR 20, Appendix B, Table 2, Column 2 for radionuclides other than noble gases and 2E-4 μCi/ml total activity concentration for all noble gases as specified in ODCMS 3.8.B.1. This methodology is consistent with the additional guidance the

NRC provided to the industry during the implementation of the updated 10 CFR 20 which changed the criterion for controlling release rate based on Effective Concentration (EC) values in the updated 10 CFR 20 as opposed to the Maximum Permissible Concentration (MPC) values in the former 10 CFR 20.

Each tank of radioactive waste is sampled prior to release and is quantitatively analyzed for identifiable gamma emitters as specified in Table 4.8.B.1 of the ODCMS. While non-gamma emitters are not specifically addressed, the conservatisms inherent in the calculation of the maximum permissible release rate are more than adequate to account for them. From this gamma isotopic analysis the maximum permissible release flow rate is determined as follows:

Determine a Dilution Factor by:

$$\text{Dilution Factor} = \sum_i \frac{\mu Ci / ml_i}{10 \times ECL_i} \; 1$$

$\mu Ci / ml_i$ = the activity of each identified gamma emitter in $\mu Ci/ml$

ECL_i = The effluent concentration specified in 10 CFR 20, Appendix B, Table 2, Column 2 for radionuclides other than noble gases or 2×10^{-4} $\mu Ci/ml$ for noble gases.

Determine the Maximum Permissible Release Rate with this Dilution Factor by:

$$\text{Release Rate (gpm)} = \frac{A \times 2.0 \times 10^5}{B \times C \times \text{Dilution Factor}}$$

A = The number of circulating water pumps running which will provide dilution

2.0×10^5 = the flow rate in gpm for each circulating water pump running

B = margin of assurance which includes consideration of the maximum error in the activity setpoint, the maximum error in the flow setpoint, and possible loss of 5 out of the 6 possible circulating water pumps during a release. The value used for B is 10.0.

C = concentration gradient factor. The value used for C is 5.0 for discharge canal water levels less than 104' and 3.0 for canal water levels greater than 104'. This just adds another factor of conservatism.

III.B ODCMS 4.8.B.2.1

Dose contributions from liquid effluents released to areas at and beyond the SITE BOUNDARY shall be calculated using the equation below. This dose calculation uses those appropriate radionuclides listed in Table III.A.1. These radionuclides account for virtually 100 percent of the total body dose and organ dose from liquid effluents.

The dose for each age group and each organ should be calculated to determine the maximum total body dose and organ dose for each quarter and the year, as appropriate. Cumulative dose files for quarterly and yearly doses should be maintained separately and the maximum total body and organ dose reported in each case. CM-1 NRC URI 88-33-01, T00353.

$$D_\tau = \sum_i \left[A_{i\tau} \sum_{t=1}^{n} \Delta t_t \, C_{it} \, F_t \right]$$

where:

D_τ = The cumulative dose commitment to the total body or any organ, τ, from liquid effluents for the total time period $\sum_{t=1}^{n} \Delta t_t$, in mrem.

Δt_ℓ = The length of the ℓth time period over which $C_{i\ell}$ and F_ℓ are averaged for the liquid release, in hours.

$C_{i\ell}$ = The average concentration of radionuclide, i, in undiluted liquid effluent during time period Δt_ℓ from any liquid release, (determined by the effluent sampling analysis program, ODCMS Table 4.8.B.1), in μCi/ml.

$A_{i\tau}$ = The site related ingestion dose commitment factor to the total body or organ, τ, for each radionuclide listed in Table III.A.1, in mrem-ml per hr-μCi. See Site Specific Data.**

F_ℓ = The near field average dilution factor for $C_{i\ell}$ during any liquid effluent release. Defined as the ratio of the maximum undiluted liquid waste flow during release to the average flow through the discharge pathway.

III.C ODCMS 4.8.B.4.1

Projected dose contributions from liquid effluents shall be calculated using the methodology described in section III.B.

** See Note 1 in Bases

TABLE III.A.1

LIQUID EFFLUENT INGESTION DOSE FACTORS
(DECAY CORRECTED)
A_{it} DOSE FACTOR (MREM-ML PER HR-μCi)

TOTAL BODY

RADIO-NUCLIDE	ADULT	TEEN	CHILD
H-3	2.13E+00	1.53E+00	2.70E+00
NA-24	1.65E+02	1.70E+02	1.98E+02
P-32	5.93E+04	6.49E+04	8.33E+04
CR-51	1.49E+00	1.53E+00	1.69E+00
MN-54	9.82E+02	1.00E+03	1.08E+03
FE-55	1.31E+02	1.40E+02	1.96E+02
FE-59	1.14E+03	1.17E+03	1.36E+03
CO-57	4.55E+01	4.71E+01	5.78E+01
CO-58	2.59E+02	2.62E+02	3.17E+02
CO-60	7.40E+02	7.48E+02	9.07E+02
ZN-65	3.87E+04	3.95E+04	4.16E+04
SR-89	8.83E+02	9.45E+02	1.48E+03
SR-90	1.88E+05	1.56E+05	1.72E+05
Y-91M	5.85E-13	6.14E-13	9.35E-14
Y-93	1.27E-03	1.34E-03	2.16E-03
NB-95	1.52E+02	1.56E+02	1.68E+02
NB-95M	no data	no data	no data
ZR-95	1.77E-01	1.72E-01	3.48E-01
ZR-97	1.56E-03	1.56E-03	3.43E-03
MO-99	2.91E+01	3.01E+01	5.53E+01

TC-99M	3.33E-02	3.33E-02	4.93E-02
RU-103	3.57E+00	3.60E+00	5.97E+00
RU-105	1.73E-01	1.78E-01	3.16E-01
AG-110M	2.13E+00	2.04E+00	4.23E+00
SN-113	no data	no data	no data
TE-129M	2.01E+03	2.17E+03	2.79E+03
TE-131M	4.57E+02	4.81E+02	5.74E+02
TE-132	1.40E+03	1.44E+03	1.65E+03
SB-124	6.33E+02	6.54E+02	7.54E+02
SB-125	2.15E+02	2.51E+02	3.08E+02
I-131	1.86E+02	1.79E+02	2.36E+02
I-133	1.97E+01	2.03E+01	3.20E+01
I-135	2.04E+00	2.06E+00	3.12E+00
CS-134	6.74E+05	3.88E+05	1.49E+05
CS-136	9.79E+04	9.15E+04	7.30E+04
CS-137	3.98E+05	2.20E+05	8.49E+04
CS-138	2.65E-09	2.78E-09	3.25E-09
BA-139	5.01E-07	5.17E-07	1.18E-06
BA-140	3.66E+01	3.62E+01	7.42E+01
LA-140	1.92E-02	1.97E-02	2.78E-02
LA-142	2.46E-08	2.52E-08	3.59E-08
CE-141	1.45E-02	1.46E-02	3.86E-02
CE-143	1.68E-03	1.69E-03	4.44E-03

NOTE: The listed dose factors are for radionuclides that may be detected in liquid effluents and have significant dose consequences. The factors are decayed for one day to account for the time between effluent release and ingestion of fish by the maximum exposed individual.

TABLE III.A.1
LIQUID EFFLUENT INGESTION DOSE FACTORS
(DECAY CORRECTED)

A_{it} DOSE FACTOR (MREM-ML PER HR-μCi)

RADIO-NUCLIDE	LIVER ADULT	LIVER TEEN	LIVER CHILD
H-3	2.13E+00	1.53E+00	2.70E+00
NA-24	1.65E+02	1.70E+02	1.98E+02
P-32	9.55E+04	1.04E+05	1.01E+05
CR-51	no data	no data	no data
MN-54	5.15E+03	5.06E+03	4.03E+03
FE-55	5.62E+02	6.01E+02	6.33E+02
FE-59	2.96E+03	3.02E+03	2.73E+03
CO-57	2.74E+01	2.81E+01	2.86E+01
CO-58	1.16E+02	1.14E+02	1.04E+02
CO-60	3.35E+02	3.32E+02	3.07E+02
ZN-65	8.55E+04	8.46E+04	6.69E+04
SR-89	no data	no data	no data
SR-90	no data	no data	no data
Y-91M	no data	no data	no data
Y-93	no data	no data	no data
NB-95	2.83E+02	2.84E+02	2.35E+02
NB-95M	no data	no data	no data
ZR-95	2.61E-01	2.50E-01	3.91E-01
ZR-97	8.43E-03	3.39E-03	5.82E-03
MO-99	1.53E+02	1.58E+02	2.23E+02

TC-99M	2.61E-03	2.57E-03	2.98E-03
RU-103	no data	no data	no data
RU-105	no data	no data	no data
AG-110M	3.58E+00	3.36E+00	5.30E+00
SN-113	no data	no data	no data
TE-129M	4.74E+03	5.09E+03	5.02E+03
TE-131M	5.48E+02	5.77E+02	5.40E+02
TE-132	1.48E+03	1.53E+03	1.36E+03
SB-124	3.01E+01	3.09E+01	2.79E+01
SB-125	9.57E+01	1.17E+01	1.04E+02
I-131	3.25E+02	3.32E+02	4.16E+02
I-133	6.48E+01	6.66E+01	8.45E+01
I-135	5.52E+00	5.55E+00	1.63E+00
CS-134	8.25E+05	8.36E+05	7.06E+05
CS-136	1.36E+05	1.36E+05	1.13E+05
CS-137	6.07E+05	6.32E+05	5.75E+05
CS-138	5.34E-09	5.56E-09	5.12E-09
BA-139	1.22E-08	1.25E-08	2.17E-08
BA-140	7.00E-01	6.90E-01	1.11E+00
LA-140	7.28E-02	7.40E-02	8.25E-02
LA-142	9.89E-08	1.01E-07	1.15E-07
CE-141	1.28E-01	1.27E-01	2.60E-01
CE-143	1.52E+01	1.51E+01	3.07E+01

NOTE: The listed dose factors are for radionuclides that may be detected in liquid effluents and have significant dose consequences. The factors are decayed for one day to account for the time between effluent release and ingestion of fish by the maximum exposed individual.

TABLE III.A.1

LIQUID EFFLUENT INGESTION DOSE FACTORS
(DECAY CORRECTED)
A_{it} DOSE FACTOR (MREM-ML PER HR-μCi)

RADIO-NUCLIDE	BONE ADULT	BONE TEEN	BONE CHILD
H-3	no data	no data	no data
NA-24	1.65E+02	1.70E+02	1.98E+02
P-32	2.38E+05	2.58E+05	3.35E+05
CR-51	no data	no data	no data
MN-54	no data	no data	no data
FE-55	8.12E+02	8.47E+02	1.19E+03
FE-59	1.26E+03	1.30E+03	1.68E+03
CO-57	no data	no data	no data
CO-58	no data	no data	no data
CO-60	no data	no data	no data
ZN-65	2.69E+04	2.43E+04	2.51E+04
SR-89	3.08E+04	3.30E+04	5.19E+04
SR-90	7.67E+05	6.31E+05	6.78E+05
Y-91M	1.51E-11	1.61E-11	2.57E-11
Y-93	4.58E-02	4.90E-02	7.77E-02
NB-95	5.08E+02	5.12E+02	6.04E+02
NB-95M	no data	no data	no data
ZR-95	8.13E-01	7.94E-01	1.78E+00
ZR-97	1.69E-02	1.71E-02	4.03E-02
MO-99	no data	no data	no data

TC-99M	9.24E-04	9.22E-04	1.52E-03
RU-103	8.30E+00	8.43E+00	1.55E+01
RU-105	4.39E-01	4.59E-01	8.71E-01
AG-110M	3.87E+00	3.55E+00	7.84E+00
SN-113	no data	no data	no data
TE-129M	1.27E+04	1.37E+04	1.80E+04
TE-131M	1.12E+03	1.21E+03	1.56E+03
TE-132	2.29E+03	2.42E+03	3.07E+03
SB-124	1.60E+03	1.68E+03	2.15E+03
SB-125	4.75E+03	1.07E+03	1.39E+03
I-131	2.28E+02	2.38E+02	4.13E+02
I-133	3.72E+01	3.92E+01	6.84E+01
I-135	2.11E+00	2.16E+00	3.66E+00
CS-134	3.47E+05	3.55E+05	4.30E+05
CS-136	3.45E+04	3.46E+04	4.10E+04
CS-137	4.44E+05	4.75E+05	6.01E+05
CS-138	2.70E-09	2.90E-09	3.68E-09
BA-139	1.71E-05	1.77E-05	4.07E-05
BA-140	5.57E+02	5.63E+02	1.27E+03
LA-140	1.44E-01	1.51E-01	2.36E-01
LA-142	2.18E-07	2.28E-07	3.94E-07
CE-141	1.89E-01	1.90E-01	5.21E-01
CE-143	2.06E-02	2.07E-02	5.66E-02

NOTE: The listed dose factors are for radionuclides that may be detected in liquid effluents and have significant dose consequences. The factors are decayed for one day to account for the time between effluent release and ingestion of fish by the maximum exposed individual.

TABLE III.A.1

LIQUID EFFLUENT INGESTION DOSE FACTORS
(DECAY CORRECTED)
A_{it} DOSE FACTOR (MREM-ML PER HR-μCi)

RADIO-NUCLIDE	KIDNEY ADULT	KIDNEY TEEN	KIDNEY CHILD
H-3	2.13E+00	1.53E+00	2.70E+00
NA-24	1.65E+02	1.70E+02	1.98E+02
P-32	no data	no data	no data
CR-51	3.28E-01	3.35E-01	2.57E-01
MN-54	1.53E+03	1.51E+03	1.13E+03
FE-55	no data	no data	no data
FE-59	no data	no data	no data
CO-57	no data	no data	no data
CO-58	no data	no data	no data
CO-60	no data	no data	no data
ZN-65	5.72E+04	5.41E+04	4.22E+04
SR-89	no data	no data	no data
SR-90	no data	no data	no data
Y-91M	no data	no data	no data
Y-93	no data	no data	no data
NB-95	2.79E+02	2.75E+02	2.21E+02
NB-95M	no data	no data	no data
ZR-95	4.09E-01	3.68E-01	5.60E-01
ZR-97	5.14E-03	5.14E-03	8.35E-03
MO-99	3.46E+02	3.61E+02	4.77E+02

TC-99M	3.96E-02	3.83E-02	4.33E-02
RU-103	3.17E+01	2.97E+01	3.91E+01
RU-105	5.68E+00	5.78E+00	7.66E+00
AG-110M	7.04E+00	6.40E+00	9.86E+00
SN-113	no data	no data	no data
TE-129M	5.31E+04	5.74E+04	5.29E+04
TE-131M	5.55E+03	6.01E+03	5.22E+03
TE-132	1.43E+04	1.47E+04	1.27E+04
SB-124	no data	no data	no data
SB-125	no data	no data	no data
I-131	5.57E+02	5.73E+02	6.82E+02
I-133	1.12E+02	1.16E+02	1.41E+02
I-135	8.86E+00	8.77E+00	1.01E+01
CS-134	2.67E+05	2.66E+05	2.19E+05
CS-136	7.57E+04	7.42E+04	6.00E+04
CS-137	2.06E+05	2.15E+05	1.87E+05
CS-138	3.92E-09	4.10E-09	3.60E-09
BA-139	1.14E-08	1.18E-08	1.90E-08
BA-140	2.38E-01	2.34E-01	3.62E-01
LA-140	no data	no data	no data
LA-142	no data	no data	no data
CE-141	5.94E-02	5.98E-02	1.14E-01
CE-143	6.70E-03	6.77E-03	1.29E-02

NOTE: The listed dose factors are for radionuclides that may be detected in liquid effluents and have significant dose consequences. The factors are decayed for one day to account for the time between effluent release and ingestion of fish by the maximum exposed individual.

TABLE III.A.1

LIQUID EFFLUENT INGESTION DOSE FACTORS
(DECAY CORRECTED)
A_{it} DOSE FACTOR (MREM-ML PER HR-μCi)

RADIO-NUCLIDE	GI-LLI ADULT	GI-LLI TEEN	GI-LLI CHILD
H-3	2.13E+00	1.53E+00	2.70E+00
NA-24	1.65E+02	1.70E+02	1.98E+02
P-32	1.73E+05	1.41E+05	5.98E+04
CR-51	3.74E+02	2.57E+02	8.98E+01
MN-54	1.58E+04	1.04E+04	3.38E+03
FE-55	3.22E+02	2.60E+02	1.17E+02
FE-59	9.90E+03	7.15E+03	2.84E+03
CO-57	6.94E+02	5.24E+02	2.34E+02
CO-58	2.35E+03	1.56E+03	6.04E+02
CO-60	6.30E+03	4.33E+03	1.70E+03
ZN-65	5.38E+04	3.58E+04	1.18E+04
SR-89	4.94E+03	3.93E+03	2.01E+03
SR-90	2.22E+04	1.77E+04	9.13E+03
Y-91M	4.44E-11	7.58E-10	5.03E-08
Y-93	1.45E+03	1.50E+03	1.18E+03
NB-95	1.72E+06	1.21E+06	4.35E+05
NB-95M	no data	no data	no data
ZR-95	8.27E+02	5.78E+02	4.08E+02
ZR-97	1.06E+03	9.19E+02	8.81E+02
MO-99	3.54E+02	2.82E+02	1.85E+02

TC-99M	1.54E+00	1.69E+00	1.69E+00
RU-103	9.69E+02	7.04E+02	4.01E+02
RU-105	2.69E+02	3.70E+02	5.69E+02
AG-110M	1.46E+03	9.43E+02	6.30E+02
SN-113	no data	no data	no data
TE-129M	6.40E+04	5.15E+04	2.19E+04
TE-131M	5.44E+04	4.63E+04	2.19E+04
TE-132	7.02E+04	4.85E+04	1.37E+04
SB-124	4.53E+04	3.38E+04	1.35E+04
SB-125	5.93E+04	4.85E+04	2.13E+04
I-131	8.58E+01	6.57E+01	3.70E+01
I-133	5.82E+01	5.03E+01	3.40E+01
I-135	6.24E+00	6.16E+00	5.03E+00
CS-134	1.44E+04	1.04E+04	3.80E+03
CS-136	1.55E+04	1.09E+04	3.96E+03
CS-137	1.18E+04	9.00E+03	3.60E+03
CS-138	2.28E-14	2.52E-12	2.36E-09
BA-139	3.04E-05	1.58E-04	2.35E-03
BA-140	1.15E+03	8.69E+02	6.43E+02
LA-140	5.34E+03	4.25E+03	2.30E+03
LA-142	7.22E-04	3.08E-03	2.27E-02
CE-141	4.89E+02	3.63E+02	3.24E+02
CE-143	5.69E+02	4.54E+02	4.49E+02

NOTE: The listed dose factors are for radionuclides that may be detected in liquid effluents and have significant dose consequences. The factors are decayed for one day to account for the time between effluent release and ingestion of fish by the maximum exposed individual.

IV. Gaseous Pathway Dose Calculations

IV.A. ODCMS 4.8.C.1.1 and 4.8.C.1.2

The dose rate in areas at and beyond the SITE BOUNDARY due to radioactive materials released in gaseous effluents shall be determined by the expressions below:

IV.A.1 Noble Gases:

The dose rate from radioactive noble gas releases shall be determined by either of two methods. Method (a), the Gross Release Method, assumes that all noble gases released are the most limiting nuclide - Kr-88 for total body dose (vent and stack releases) and skin dose (vent releases) and Kr-87 for skin dose (stack releases). Method (b), the Isotopic Analysis Method, utilizes the results of noble gas analyses required by ODCMS 4.8.C.1.1.

a. Gross Release Method

$$D_{TB} = V \dot{Q}_{KrS} + K \left(\overline{\chi/Q}\right)_v \dot{Q}_{KrV}$$

$$D_S = \left[L_S \left(\overline{\chi/Q}\right)_S + 1.1B\right] \dot{Q}_{KrS} + \left[L_V + 1.1M\right]\left(\overline{\chi/Q}\right)_V \dot{Q}_{KrV}$$

where:

The location is the site boundary, 1097m SSE from the vents. This location results in the highest calculated dose to an individual from noble gas releases.

D_{TB} = total body dose rate, in mrem/yr.

D_S = skin dose rate, in mrem/yr.

V = 4.72×10^{-4} mrem/yr per µCi/sec; the constant for Kr-88 accounting for the gamma radiation from the elevated finite plume. This constant was developed using MARE program with plant specific inputs for PBAPS.

IV.A.1.a (Cont'd)

Q_{ns} = The gross release rate of noble gases from the stack determined by gross activity stack monitors averaged over one hour, in µCi/sec.

K = 1.47 X 10^4 mrem/yr per µCi/m^3; the total body dose factor due to gamma emissions for Kr-88 (Reg. Guide 1.109, Table B-1).

16NOV12 $(\chi/Q)_v$ = 1.12 X 10^{-6} sec/m^3; the highest calculated annual average relative concentration for any area at or beyond the SITE BOUNDARY for all vent releases.

Q_{nv} = The gross release rate of noble gases in gaseous effluents from vent releases determined by gross activity vent monitors averaged over one hour, in µCi/sec.

L_v = 2.37 x 10^3 mrem/yr per µCi/m^3; the skin dose factor due to beta emissions for Kr-88. (Reg. Guide 1.109, Table B-1).

L_s = 9.73 X 10^3 mrem/yr per µCi/m^3; the skin dose factor due to beta emissions for Kr-87. (Reg. Guide 1.109, Table B-1).

$(\chi/Q)_s$ = 9.97 X 10^{-8} sec/m^3; the highest calculated annual average relative concentration from the stack releases for any area at or beyond the SITE BOUNDARY.

B = 1.74 X 10^{-4} mrad/yr per µCi/sec; the constant for Kr-87 accounting for the gamma radiation from the elevated finite plume. This constant was developed using MARE program with plant specific inputs for PBAPS.

M = 1.52 X 10^4 mrad/yr per µCi/m^3; the air dose factor due to gamma emissions for Kr-88. (Reg. Guide 1.109, Table B-1).

1.1 = Unit conversion, converts air dose to skin dose, mrem/mrad.

IV.A.1. b. Isotopic Analysis Method

$$D_{TB} = \sum_i \left(V_i \, \dot{Q}_{is} + K_i \, (\overline{\chi/Q})_v \, \dot{Q}_{iv} \right)$$

$$D_S = \sum_i \left[\left(L_i \, (\overline{\chi/Q})_s + 1.1 B_i \right) \dot{Q}_{is} + \left(L_i + 1.1 M_i \right) (\overline{\chi/Q})_v \, \dot{Q}_{iv} \right]$$

where:

The location is the site boundary, 1097m SSE from the vents. This location results in the highest calculated dose to an individual from noble gas releases.

D_{TB} = total body dose rate, in mrem/yr.

D_S = skin dose rate, in mrem/yr.

V_i = The constant for each identified noble gas radionuclide for the gamma radiation from the elevated finite plume. The constants were developed using the MARE program with plant specific inputs for PBAPS. Values are listed on Table IV.A.1, in mrem/yr per µCi/sec.

$\dot{Q}_{is}$ = The release rate of noble gas radionuclide, i, in gaseous effluents from the stack determined by isotopic analysis averaged over one hour, in µCi/sec.

K_i = The total body dose factor due to gamma emissions for each identified noble gas radionuclide. Values are listed on Table IV.A.1, in mrem/yr per µCi/m^3.

16NOV12 $(\overline{\chi/Q})_v$ = 1.12×10^{-6} sec/m^3; the highest calculated annual average relative concentration for any area at or beyond the SITE BOUNDARY for all vent releases.

$\dot{Q}_{iv}$ = The release rate of noble gas radionuclide, i, in gaseous effluents from all vent releases determined by isotopic analysis averaged over one hour, in µCi/sec.

IV.A.1.b (Cont'd)

L_i = The skin dose factor due to beta emissions for each identified noble gas radionuclide. Values are listed on Table IV.A.1, in mrem/yr per $\mu Ci/m^3$.

$(\overline{\chi/Q})_s$ = 9.97×10^{-8} sec/m^3; the highest calculated annual average relative concentration from the stack releases for any area at or beyond the SITE BOUNDARY.

B_i = The constant for each identified noble gas radionuclide accounting for the gamma radiation from the elevated finite plume. The constants were developed using MARE program with plant specific inputs for PBAPS. Values are listed on Table IV.A.1, in mrad/yr per $\mu Ci/sec$.

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide. Values are listed on Table IV.A.1, in mrad/yr per $\mu Ci/m^3$.

Ll = Unit conversion, coverts air dose to skin dose, mrem/mrad.

TABLE IV.A.1 - Constants for Isotopic Analysis Method
(corrected for decay during transit)

Radionuclide	Plume-Air Dose Factor B_i (mrad/yr per µCi/sec)	Total Body Dose Factor K_i (mrem/yr per µCi/m³)	Skin Dose Factor L_i (mrem/yr per µCi/m³)	Gamma Air Dose Factor M_i (mrad/yr per µCi/m³)	Beta Air Dose Factor N_i (mrad/yr per µCi/m³)	Plume-Body Dose Factor V_i (mrem/yr per µCi/sec)
Kr-85m	4.02E-05	1.17E+03	1.46E+03	1.23E+03	1.97E+03	3.76E-05
Kr-87	1.74E-04	5.92E+03	9.73E+03	6.17E+03	1.03E+04	1.66E-04
Kr-88	4.90E-04	1.47E+04	2.37E+03	1.52E+04	2.93E+03	4.72E-04
Xe-133	1.19E-05	2.94E+02	3.06E+02	3.53E+02	1.05E+03	1.11E-05
Xe-133m	1.09E-05	2.51E+02	9.94E+02	3.27E+02	1.48E+03	1.01E-05
Xe-135	6.37E-05	1.81E+03	1.86E+03	1.92E+03	2.46E+03	5.95E-05
Xe-135m	6.61E-05	2.53E+03	5.76E+02	2.72E+03	5.99E+02	6.17E-05
Xe-138	1.52E-04	6.98E+03	3.26E+03	7.28E+03	3.75E+03	1.46E-04

The values K_i, L_i, M_i, and N_i are taken from Reg. Guide 1.109, Table B-1. The values B_i and V_i were developed using the MARE program with plant specific inputs for PBAPS.

IV.A.2 Iodine-131, iodine-133, tritium and radioactive materials in particulate form, other than noble gases, with half-lives greater than eight days:

The dose rate shall be determined for either of two critical organs and most restrictive age group. Child thyroid dose is limiting when iodine releases exceed 10 percent of the total release rates. The teenager lung dose is limiting when iodine is either not present or a small fraction of the total release.

When it is not clear which organ dose will be limiting, doses for both restrictive age group organs will be calculated and the limiting organ dose identified.

$$D=\sum_i P_i \left[W_s \dot{Q}_{is} + W_v \dot{Q}_{iv} + W_v \dot{q}_{iv}\right]$$

where:
The location is the site boundary, 1097m SSE from the vents.

D = dose rate to the critical organ most restrictive age group, in mrem/yr.

P_i = The dose parameter for radionuclides other than noble gases for the inhalation pathway. The dose factors are based on the critical organ, and most restrictive age group. All values are from Reg. Guide 1.109 (Tables E-5, E-8, E-9 and E-10). Values are listed on Table IV.A.2, in mrem/yr per $\mu Ci/m^3$

W_s = 1.03×10^{-7} sec/m^3; the highest calculated annual average relative concentration for any area at or beyond the SITE BOUNDARY from stack releases. (SSE boundary)

Q_{is} = The release rate of radionuclides; i, in gaseous effluents from the stack determined by the effluent sampling and analysis program (ODCMS Table 4.8.C.1) in $\mu Ci/sec$.

W_v = 4.78×10^{-7} sec/m^3; the highest calculated annual average relative concentration for any area at or beyond the SITE BOUNDARY for all vent releases. (SSE boundary)

IV.A.2. (Cont'd)

Q_{iv} = The release rate of radionuclide, i,in gaseous effluents from all vent releases, determined by the effluent sampling and analysis program (ODCMS Table 4.8.C.1) in µCi/sec.

q_{iv} = The release rate of radionuclide, i, in gaseous effluents from the auxiliary boiler stack releases, determined by the oil sampling and analysis program (ODCM Specification Table 4.8.C.1) in µCi/sec as calculated below:

$$= \sum_{i} \frac{C_{iv} \times 3785 \times Z}{T}$$

where:

The location is the site boundary, 1097m SSE from the vents.

C_{iv} = activity concentration measured in oil for nuclide, i, in µCi/ml.

3785 = milliliters per gallon.

Z = gallons of oil consumed.

T = number of seconds used for release
Method (a) 60 second
Method (b) number of seconds used to burn oil for release.

TABLE IV.A.2
Pi CONSTANTS FOR CRITICAL ORGAN FOR THE
MOST RESTRICTIVE AGE GROUP

(mrem/yr per $\mu Ci/m^3$)

RADIONUCLIDE	INFANT THYROID DOSE FACTOR	INFANT LUNG DOSE FACTOR	CHILD THYROID DOSE FACTOR	TEENAGER LUNG DOSE FACTOR
H-3	6.47E+02	6.47E+02	1.13E+03	1.27E+03
C-14	5.31E+03	5.31E+03	6.73E+03	4.87E+03
NA-24	1.06E+04	1.06E+04	1.61E+04	1.38E+04
P-32	no data	no data	no data	no data
Cr-51	5.75E+01	1.28E+04	8.55+01	2.10E+04
MN-54	no data	1.00E+06	no data	1.98E+06
FE-55	no data	8.69E+04	no data	1.24E+05
MN-56	no data	1.25E+04	no data	1.52E+04
CO-58	no data	7.77E+05	no data	1.34E+06
FE-59	no data	1.02E+06	no data	1.53E+06
CO-60	no data	4.51E+06	no data	8.72E+06
NI-63	no data	2.09E+05	no data	3.07E+05
CU-64	no data	9.30E+03	no data	1.11E+04
NI-65	no data	8.12E+03	no data	9.36E+03
ZN-65	no data	6.47E+05	no data	1.24E+06
ZN-69	no data	1.47E+03	no data	1.58E+03
BR-83	no data	no data	no data	no data
BR-84	no data	no data	no data	no data
BR-85	no data	no data	no data	no data
BR-86	no data	no data	no data	no data
BR-88	no data	no data	no data	no data

BR-89	no data	no data	no data	no data
SR-89	no data	2.03E+06	no data	2.42E+06
SR-90	no data	1.12E+07	no data	1.65E+07
Y-90	no data	2.69E+05	no data	2.93E+05
SR-91	no data	5.26E+04	no data	6.07E+04
Y-91M	no data	2.79E+03	no data	3.20E+03
Y-91	no data	2.45E+06	no data	2.94E+06
SR-92	no data	2.38E+04	no data	2.74E+04
Y-92	no data	2.45E+04	no data	2.68E+04
Y-93	no data	7.64E+04	no data	8.32E+04
NB-95	no data	4.79E+05	no data	7.51E+05
ZR-95	no data	1.75E+06	no data	2.69E+06
ZR-97	no data	1.10E+05	no data	1.30E+05
MO-99	no data	1.35E+05	no data	1.54E+05
TC-99M	no data	8.11E+02	no data	1.15E+03
TC-101	no data	5.84E+02	no data	6.67E+02
RU-103	no data	5.52E+05	no data	7.83E+05
RU-105	no data	1.57E+04	no data	1.82E+04
RU-106	no data	1.16E+07	no data	1.61E+07
AG-110M	no data	3.67E+06	no data	6.75E+06
TE-125M	1.62E+03	4.47E+05	1.92E+03	5.36E+05
TE-127M	4.87E+03	1.31E+06	6.07E+03	1.66E+06
TE-127	1.85E+00	1.04E+04	1.96E+00	1.12E+04
TE-129M	5.47E+03	1.68E+06	6.33E+03	1.98E+06
TE-129	6.75E-02	3.00E+03	7.14E-02	3.30E+03
I-130	1.60E+06	no data	1.85E+06	no data
I-131	1.48E+07	no data	1.62E+07	no data
TE-131M	8.93E+01	1.99E+05	9.77E+01	2.38E+05

TE-131	1.58E-02	2.06E+03	1.70E-02	2.34E+03
I-132	1.69E+05	no data	1.94E+05	no data
TE-132	2.79E+02	3.40E+05	3.18E+02	4.49E+05
I-133	3.56E+06	no data	3.85E+06	0.00E+00
CS-134	no data	7.97E+04	0.00E+00	1.46E+05
I-134	4.45E+04	no data	5.07E+04	no data
I-135	6.96E+05	no data	7.92E+05	no data
CS-136	no data	1.18E+04	no data	1.78E+04
CS-137	no data	7.13E+04	no data	1.21E+05
CS-138	no data	6.54E+01	no data	7.87E+01
BA-139	no data	5.95E+02	no data	6.46E+03
BA-140	no data	1.60E+06	no data	2.03E+06
LA-140	no data	1.68E+05	no data	2.14E+05
BA-141	no data	2.97E+03	no data	3.29E+03
CE-141	no data	5.17E+05	no data	6.14E+05
BA-142	no data	1.55E+03	no data	1.91E+03
LA-142	no data	8.22E+03	no data	1.02E+04
CE-143	no data	1.16E+05	no data	1.30E+05
PR-143	no data	4.33E+05	no data	4.83E+05
CE-144	no data	9.84E+06	no data	1.34E+07
PR-144	no data	1.61E+03	no data	1.75E+03
ND-147	no data	3.22E+05	no data	3.72E+05
W-187	no data	3.96E+04	no data	4.74E+04
NP-239	no data	5.95E+04	no data	6.49E+04

IV.B. ODCMS 4.8.C.2.1

The air dose in areas at and beyond the SITE BOUNDARY due to noble gases released in gaseous effluents shall be determined by the expressions below.

The air dose shall be determined by either of two methods. Method (a), the Gross Release Method, assumes that all noble gases released are the most limiting nuclide - Kr-88 for gamma radiation and Kr-87 for beta radiation. Method (b), the Isotopic Analysis Method, utilizes the results of noble gas analyses required by ODCMS 4.8.C.1.1.

IV.B.1 for gamma radiation:

a. Gross Release Method

$$D_\gamma = 3.17 \times 10^{-8} \left[M \left(\overline{\chi/Q}\right)_v \tilde{Q}_v + B \tilde{Q}_s \right]$$

where:

The location is the SITE BOUNDARY 1097m SSE from the vents. This location results in the highest calculated gamma air dose from noble gas releases.

D_γ = gamma air dose, in mrad.

3.17×10^{-8} = years per second.

M = 1.52×10^{4} mrad/yr per $\mu Ci/m^3$; the air dose factor due to gamma emissions for Kr-88. (Reg. Guide 1.109, Table B-1)

16NOV12 $\left(\overline{\chi/Q}\right)_v$ = 1.12×10^{-6} sec/m^3; the highest calculated annual average relative concentration from vent releases for any area at or beyond the SITE BOUNDARY.

$\tilde{Q}_v$ = The gross release of noble gas radionuclides in gaseous effluents from all vents, determined by gross activity vent monitors, in µCi. Releases shall be cumulative over the calendar quarter or year as appropriate.

IV.B.1. a (Cont'd)

B = 4.90×10^{-4} mrad/year per µCi/sec; the constant for Kr-88 accounting for the gamma radiation from the elevated finite plume. The constant was developed using the MARE program with plant specific inputs for PBAPS.

$\tilde{Q}_s$ = The gross release of noble gas radionuclides in gaseous releases from the stack determined by gross activity stack monitor in µCi. Releases shall be cumulative over the calendar quarter or year as appropriate.

b. Isotopic Analysis Method

$$D_\gamma = 3.17 \times 10^{-8} \sum_i \left[M_i \left(\overline{\chi/Q}\right)_v \tilde{Q}_{iv} + B_i \tilde{Q}_{is} \right]$$

where:

The location is the SITE BOUNDARY, 1097m SSE from the vents. This location results in the highest calculated gamma air dose from noble gas releases.

D_γ = gamma air dose, in mrad.

3.17×10^{-8} = years per second.

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide. Values are listed on Table IV.A.1, in mrad/yr per µCi/m³.

16NOV12

$\left(\overline{\chi/Q}\right)_v$ = 1.12×10^{-6} sec/m³; the highest calculated average relative concentration from vent releases for any area at or beyond the SITE BOUNDARY.

$\tilde{Q}_{iv}$ = The release of noble gas radionuclides, i, in gaseous effluents from all vents as determined by isotopic analysis, in µCi. Releases shall be cumulative over the calendar quarter or year, as appropriate.

B_i = The constant for each identified noble gas radionuclide accounting for the gamma radiation for the elevated finite plume. The constants were developed using the MARE program with plant specific inputs for PBAPS. Values are listed on Table IV.A.1, in mrad/yr per µCi/sec.

IV.B.1. b. (Cont'd)

$\tilde{Q}_{is}$ = The release of noble gas radionuclides, i, in gaseous effluents from the stack determined by isotopic analysis, in µCi. Releases shall be cumulative over the calendar quarter or year, as appropriate.

IV.B.2. for beta radiation:

a. Gross Release Method

$$D_\beta = 3.17 \times 10^{-8} N \left[\left(\overline{\chi/Q}\right)_v \tilde{Q}_v + \left(\overline{\chi/Q}\right)_s \tilde{Q}_s \right]$$

where:

The location is the SITE BOUNDARY 1097m SSE from the vents. This location results in the highest calculated gamma air dose from noble gas releases.

D_β = beta air dose, in mrad.

3.17×10^{-8} = years per second.

N = 1.03×10^4 mrad/yr per µCi/m^3; the air dose factor due to beta emissions for Kr-87. (Reg. Guide 1.109, Table B-1)

16NOV12 $\left(\overline{\chi/Q}\right)_v$ = 1.12×10^{-6} sec/m^3; the highest calculated annual average relative concentration from vent releases for any area at or beyond the SITE BOUNDARY.

$\tilde{Q}_v$ = The gross release of noble gas radionuclides in gaseous effluents from all vents determined by gross activity vent monitors, in µCi. Releases shall be cumulative over the calendar quarter or year, as appropriate.

$(\overline{\chi/Q})_s$ = 9.97×10^{-8} sec/m^3; the highest calculated annual average relative concentration from the stack releases for any area at or beyond the SITE BOUNDARY.

$\tilde{Q}_s$ = The gross release of noble gas radionuclides in gaseous releases from the stack determined by gross activity stack monitors, in µCi. Releases shall be cumulative over the calendar quarter or year, as appropriate.

IV.B.2. b. Isotopic Analysis Method

$$D_\beta = 3.17 \times 10^{-8} \sum_i N_i \left[(\overline{\chi/Q})_v \tilde{Q}_{iv} + (\overline{\chi/Q})_s \tilde{Q}_{is} \right]$$

3.17×10^{-8} = years per second.

N_i = The air dose factor due to beta emissions for each identified noble gas radionuclide. Values are listed on Table IV.A.1, in mrad/yr per µCi/m^3.

16NOV12 $(\overline{\chi/Q})_v$ = 1.12×10^{-6} sec/m^3; the highest calculated annual average relative concentration from vent releases for any area at or beyond the SITE BOUNDARY.

$\tilde{Q}_{iv}$ = The release of noble gas radionuclide, i, in gaseous effluents from all vents as determined by isotopic analysis, in µCi. Releases shall be cumulative over the calendar quarter or year, as appropriate.

$(\overline{\chi/Q})_s$ = 9.97×10^{-8} sec/m^3; the highest calculated annual average relative concentration from the stack releases for any area at or beyond the SITE BOUNDARY.

$\tilde{Q}_{is}$ = The release of noble gas radionuclide, i, in gaseous effluents from the stack as determined by isotopic analysis, in µCi. Releases shall be cumulative over the calendar quarter or year, as appropriate.

IV.C ODCMS 4.8.C.3.1

The dose to an individual from iodine-131, iodine-133, tritium and radioactive materials in particulate form and radionuclides other than noble gases with half-lives greater than eight days in gaseous effluents released to areas at and beyond the SITE BOUNDARY.

The dose shall be determined for the limiting organ. Infant thyroid doses are dominating any time that either iodine-131 release rates are more than two (2) percent of total release rates or iodine-133 exceeds 25 percent of total release rates. In these cases only iodine-131 and iodine-133 are potentially significant.

For cases where there is no detectable iodine releases, doses shall be determined for infant bone and liver. Both bone and liver doses are calculated because the controlling dose is dependent upon the presence of strontium.

When it is not clear whether thyroid, bone, or liver doses are controlling, all three shall be calculated and the limiting dose identified.

$$D = 3.17 \times 10^{-8} \sum_i F_e R_i \left[W_s \tilde{Q}_{is} + W_v \tilde{Q}_{iv} + W_v \tilde{q}_{iv} \right]$$

where:

Location is the critical pathway dairy 1431m WSW from vents.

D = limiting dose to the critical infant organ, from the milk, or inhalation, or ground plane pathways, in mrem.

3.17×10^{-8} = years per second.

F_e = Fraction that is elemental (0.5 for iodines and 1.0 for all other elements).

R_i = The dose factor for each identified radionuclide; i, in m^2 (mrem/yr) per µCi/sec except tritium, which is in mrem/yr per $\mu Ci/m^3$. The dose factors are for the critical individual organ for the most restrictive age group, infant. Values are listed in Table IV.C.1 for the ingestion pathway, Table IV.C.2 for the inhalation pathway, and Table IV.C.3 for the ground plane pathway. See Site Specific Data.**

IV.C (Continued)

W_s = 8.78×10^{-10} meters^{-2}; $(\overline{D/Q})$ for the food pathway for stack releases except tritium which uses a (χ/Q) of 8.78×10^{-8} sec/m^3.

Q_{is} = The release of radionuclide, i, in gaseous effluents from the stack determined by the effluent sampling and analysis program (ODCMS Table 4.8.C.1), in µCi. Releases shall be cumulative over the calendar quarter or year, as appropriate.

W_v = 1.58×10^{-9} meters^{-2}; $(\overline{D/Q})$ for the food pathway for vent releases except tritium which uses a (χ/Q) of 1.58×10^{-7} sec/m^3.

** See Note 2 and 3 in Bases

Q_{iv} = The release of radionuclide, i, in gaseous effluents from the vents determined by the effluent sampling and analysis program (ODCMS Table 4.8.C.1) in µCi. Release shall be cumulative over the calendar quarter or year, as appropriate.

$\tilde{q}_{iv}$ = The release of radionuclide, i, in gaseous effluents from the auxiliary boiler stack releases, determined by the oil sampling and analysis program (ODCMS Table 4.8.C.1) in µCi. Release shall be cumulative over the calendar quarter or year, as appropriate.

TABLE IV.C.1

Ri CONSTANTS INGESTION PATHWAY

(m^2 (mrem/yr) per μCi/sec)*

Radionuclide	Infant Bone	Infant Liver	Infant Thyroid	Infant Kidney	Infant Lung	Infant GI-LLI	Infant Skin	Infant T Body
H-3	no data	1.30E+03	1.30E+03	1.30E+03	1.30E+03	1.30E+03	no data	1.30E+03
C-14	1.26E+09	2.70E+08	2.70E+08	2.70E+08	2.70E+08	2.70E+08	no data	2.70E+08
NA-24	4.48E+06	4.48E+06	4.48E+06	4.48E+06	4.48E+06	4.48E+06	no data	4.48E+06
P-32	4.74E+10	2.79E+09	no data	no data	no data	5.41E+08	no data	1.84E+09
CR-51	no data	no data	3.35E+04	7.32E+03	6.51E+04	1.50E+06	no data	5.13E+04
MN-54	no data	1.93E+07	no data	4.28E+06	no data	7.09E+06	no data	4.38E+06
FE-55	7.09E+07	4.58E+07	no data	no data	2.24E+07	5.81E+06	no data	1.22E+07
MN-56	no data	9.24E-03	no data	7.94E-03	no data	8.39E-01	no data	1.59E-03
CO-58	no data	9.57E+06	no data	no data	no data	2.39E+07	no data	2.39E+07
FE-59	7.92E+07	1.38E+08	no data	no data	4.09E+07	6.61E+07	no data	5.45E+07
CO-60	no data	4.69E+07	no data	no data	no data	1.12E+08	no data	1.11E+08
NI-63	1.88E+10	1.17E+09	no data	no data	no data	5.80E+07	no data	6.54E+08
CU-64	no data	5.42E+04	no data	9.17E+04	no data	1.11E+06	no data	2.51E+04
NI-65	1.03E+00	1.16E-01	no data	no data	no data	6.85E+00	no data	5.29E-02
ZN-65	2.69E+09	9.22E+09	no data	4.47E+09	no data	7.78E+09	no data	4.25E+09
ZN-69	3.09E+04	5.56E+04	no data	2.31E+04	no data	4.54E+06	no data	4.14E+03
BR-83	no data	no data	no data	no data	no data	no data	no data	1.20E-01
BR-84	no data	no data	no data	no data	no data	no data	no data	1.64E-23
BR-85	no data	no data	no data	no data	no data	no data	no data	no data
RB-86	no data	6.69E+09	no data	no data	no data	1.71E+08	no data	3.31E+09
RB-88	no data	5.60E-45	no data	no data	no data	5.45E-45	no data	3.07E-45
RB-89	no data	9.86E-53	no data	no data	no data	3.36E-53	no data	6.79E-53
SR-89	4.58E+09	no data	no data	no data	no data	9.42E+07	no data	1.31E+08
SR-90	6.55E+10	no data	no data	no data	no data	8.18E+08	no data	1.67E+10
Y-90	1.99E+02	no data	no data	no data	no data	2.74E+05	no data	5.33E+00
SR-91	7.94E+04	no data	no data	no data	no data	9.40E+04	no data	2.87E+03
Y-91M	1.66E-19	no data	no data	no data	no data	5.53E-16	no data	5.65E-21
Y-91	2.77E+04	no data	no data	no data	no data	1.98E+06	no data	7.37E+02
SR-92	1.36E+00	no data	no data	no data	no data	1.47E+01	no data	5.05E-02
Y-92	1.57E-04	no data	no data	no data	no data	3.01E+00	no data	4.43E-06
Y-93	6.31E-01	no data	no data	no data	no data	4.98E+03	no data	1.72E-02
NB-95	1.98E+05	8.16E+04	no data	5.85E+04	no data	6.89E+07	no data	4.72E+04
ZR-95	2.62E+03	6.40E+02	no data	6.89E+02	no data	3.19E+05	no data	4.54E+02
ZR-97	1.19E+00	2.04E-01	no data	2.05E-01	no data	1.30E+04	no data	9.31E-02
MO-99	no data	6.07E+07	no data	9.07E+07	no data	2.00E+07	no data	1.18E+07
TC-99M	6.04E+00	1.66E+01	no data	1.78E+02	8.67E+00	4.82E+03	no data	2.14E+02
TC-101	7.44E-60	9.38E-60	no data	1.11E-58	5.11E-60	1.59E-57	no data	9.28E-59
RU-103	2.97E+03	no data	no data	6.18E+03	no data	3.61E+04	no data	9.93E+02
RU-105	2.36E-03	no data	no data	1.73E-02	no data	9.38E-01	no data	7.94E-04
RU-106	9.54E+04	no data	no data	1.13E+05	no data	7.24E+05	no data	1.19E+04
AG-110M	1.87E+08	1.37E+08	no data	1.95E+08	no data	7.09E+09	no data	9.04E+07
SB-124	5.31E+07	7.81E+05	1.41E+05	no data	3.32E+07	1.64E+08	no data	1.64E+07
SB-125	5.23E+07	5.06E+05	6.55E+04	no data	3.03E+07	6.98E+07	no data	1.08E+07
TE-125M	5.68E+07	1.90E+07	1.91E+07	no data	no data	2.71E+07	no data	7.68E+06

TE-127M	1.82E+08	6.03E+07	5.26E+07	4.48E+08	no data	7.34E+07	no data	2.20E+07
TE-127	1.85E+03	6.19E+02	1.50E+03	4.51E+03	no data	3.68E+04	no data	3.97E+02
TE-129M	1.84E+08	6.32E+07	7.08E+07	4.61E+08	no data	1.10E+08	no data	2.84E+07
TE-129	7.99E-10	2.76E-10	6.70E-10	1.99E-09	no data	6.39E-08	no data	1.87E-10
I-130	1.04E+06	2.28E+06	2.56E+08	2.51E+06	no data	4.89E+05	no data	9.17E+05
I-131	7.97E+08	9.39E+08	3.08E+11	1.10E+09	no data	3.35E+07	no data	4.13E+08
TE-131M	9.87E+05	3.97E+05	8.05E+05	2.73E+06	no data	6.69E+06	no data	3.28E+05
TE-131	1.93E-32	3.79E-33	9.15E-33	2.62E-32	no data	4.14E-31	no data	2.88E-33
I-132	3.66E-01	7.43E-01	3.48E+01	8.29E-01	no data	6.02E-01	no data	2.65E-01
TE-132	6.17E+06	3.05E+06	4.51E+06	1.91E+07	no data	1.13E+07	no data	2.85E+06
I-133	1.06E+07	1.54E+07	2.81E+09	1.81E+07	no data	2.61E+06	no data	4.52E+06
CS-134	1.90E+10	3.54E+10	no data	9.11E+09	3.73E+09	9.61E+07	no data	3.57E+09
I-134	4.81E-12	9.86E-12	2.30E-10	1.10E-11	no data	1.02E-11	no data	3.51E-12
I-135	3.21E+04	6.39E+04	5.73E+06	7.12E+04	no data	2.31E+04	no data	2.33E+04
CS-136	5.80E+08	1.71E+09	no data	6.80E+08	1.39E+08	2.59E+07	no data	6.37E+08
CS-137	2.77E+10	3.24E+10	no data	8.71E+09	3.53E+09	1.01E+08	no data	2.30E+09
CS-138	2.58E-23	4.20E-23	no data	2.09E-23	3.27E-24	6.71E-23	no data	2.04E-23
BA-139	1.25E-07	8.32E-11	no data	5.00E-11	5.04E-11	7.95E-06	no data	3.63E-09
BA-140	7.09E+07	7.09E+04	no data	1.68E+04	4.35E+04	1.74E+07	no data	3.65E+06
LA-140	1.18E+01	4.67E+00	no data	no data	no data	5.49E+04	no data	1.20E+00
BA-141	1.41E-45	9.65E-49	no data	5.80E-49	5.87E-49	1.72E-44	no data	4.44E-47
CE-141	1.42E+04	8.69E+03	no data	2.68E+03	no data	4.49E+06	no data	1.02E+03
BA-142	7.43E-80	6.16E-83	no data	3.56E-83	3.74E-83	3.07E-79	no data	3.66E-81
LA-142	4.99E-11	1.83E-11	no data	no data	no data	3.11E-06	no data	4.39E-12
CE-143	1.16E+02	7.70E+04	no data	2.24E+01	no data	4.49E+05	no data	8.78E+00
PR-143	4.38E+02	1.64E+02	no data	6.09E+01	no data	2.31E+05	no data	2.17E+01
CE-144	1.14E+06	4.68E+05	no data	1.89E+05	no data	6.55E+07	no data	6.40E+04
PR-144	1.70E-53	6.59E-54	no data	2.39E-54	no data	3.07E-49	no data	8.58E-55
ND-147	2.58E+02	2.65E+02	no data	1.02E+02	no data	1.68E+05	no data	1.63E+01
W-187	1.79E+04	1.24E+04	no data	no data	no data	7.31E+05	no data	4.30E+03
NP-239	1.06E+01	9.51E-01	no data	1.90E+00	no data	2.75E+04	no data	5.37E-01
NP-237	5.33E+07	3.53E+06	no data	1.41E+07	no data	1.83E+06	no data	2.33E+06
NP-238	1.02E+02	2.56E+00	no data	5.58E+00	no data	3.42E+04	no data	1.57E+00

* Tritium R_i values in units of mrem/yr per $\mu Ci/m^3$

TABLE IV.C.2
Ri CONSTANTS INHALATION PATHWAY
(mrem/yr per μCi/m³)

Radionuclide	Infant Bone	Infant Liver	Infant Thyroid	Infant Kidney	Infant Lung	Infant GI-LLI	Infant Skin	Infant T Body
Nuclide	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	Skin	T Body
H-3	no data	6.47E+02	6.47E+02	6.47E+02	6.47E+02	6.47E+02	no data	6.47E+02
C-14	2.65E+04	5.31E+03	5.31E+03	5.31E+03	5.31E+03	5.31E+03	no data	5.31E+03
NA-24	1.06E+04	1.06E+04	1.06E+04	1.06E+04	1.06E+04	1.06E+04	no data	1.06E+04
P-32	2.03E+06	1.12E+05	no data	no data	no data	1.61E+04	no data	7.74E+04
CR-51	no data	no data	5.75E+01	1.32E+01	1.28E+04	3.57E+02	no data	8.95E+01
MN-54	no data	2.53E+04	no data	4.98E+03	1.00E+06	7.06E+03	no data	4.98E+03
FE-55	1.97E+04	1.18E+04	no data	no data	8.69E+04	1.10E+03	no data	3.33E+03
MN-56	no data	1.54E+00	no data	1.10E+00	1.25E+04	7.17E+04	no data	2.21E-01
CO-58	no data	1.22E+03	no data	no data	7.77E+05	1.11E+04	no data	1.82E+03
FE-59	1.36E+04	2.35E+04	no data	no data	1.02E+06	2.48E+04	no data	9.48E+03
CO-60	no data	8.02E+03	no data	no data	4.51E+06	3.19E+04	no data	1.16E+04
NI-63	3.39E+05	2.04E+04	no data	no data	2.09E+05	2.42E+03	no data	1.16E+04
CU-64	no data	1.88E+00	no data	3.98E+00	9.30E+03	1.50E+04	no data	7.74E-01
NI-65	2.39E+00	2.84E-01	no data	no data	8.12E+03	5.01E+04	no data	1.23E-01
ZN-65	1.93E+04	6.26E+04	no data	3.25E+04	6.47E+05	5.14E+04	no data	3.11E+04
ZN-69	5.39E-02	9.67E-02	no data	4.02E-02	1.47E+03	1.32E+04	no data	7.18E-03
BR-83	no data	no data	no data	no data	no data	no data	no data	3.81E+02
BR-84	no data	no data	no data	no data	no data	no data	no data	4.00E+02
BR-85	no data	no data	no data	no data	no data	no data	no data	2.04E+01
BR-86	no data	1.90E+05	no data	no data	no data	3.04E+03	no data	8.82E+04
BR-88	no data	5.57E+02	no data	no data	no data	3.39E+02	no data	2.87E+02
BR-89	no data	3.21E+02	no data	no data	no data	6.82E+01	no data	2.06E+02
SR-89	3.98E+05	no data	no data	no data	2.03E+06	6.40E+04	no data	1.14E+04
SR-90	4.09E+07	no data	no data	no data	1.12E+07	1.31E+05	no data	2.59E+06
Y-90	3.29E-03	no data	no data	no data	2.69E+05	1.04E+05	no data	8.82E+01
SR-91	9.56E+01	no data	no data	no data	5.26E+04	7.34E+04	no data	3.46E+00
Y-91M	4.07E-01	no data	no data	no data	2.79E+03	2.35E+03	no data	1.39E-02
Y-91	5.88E+05	no data	no data	no data	2.45E+06	7.03E+04	no data	1.57E+04
SR-92	1.05E+01	no data	no data	no data	2.38E+04	1.40E+05	no data	3.91E-01
Y-92	1.64E+01	no data	no data	no data	2.45E+04	1.27E+05	no data	4.61E-01
Y-93	1.50E+02	no data	no data	no data	7.64E+04	1.67E+05	no data	4.07E+00
NB-95	1.57E+04	6.43E+03	no data	4.72E+03	4.79E+05	1.27E+04	no data	3.78E+03
ZR-95	1.15E+05	2.79E+04	no data	3.11E+04	1.75E+06	2.17E+04	no data	2.03E+04
ZR-97	1.50E+02	2.56E+01	no data	2.59E+01	1.10E+05	1.40E+05	no data	1.17E+01
MO-99	no data	1.65E+02	no data	2.65E+02	1.35E+05	4.87E+04	no data	3.23E+01
TC-99M	1.40E-03	2.88E-03	no data	3.11E-02	8.11E+02	2.03E+03	no data	3.72E-02
TC-101	6.51E-05	8.23E-05	no data	9.79E-04	5.84E+02	8.44E+02	no data	8.12E-04
RU-103	2.02E+03	no data	no data	4.24E+03	5.52E+05	1.61E+04	no data	6.79E+02
RU-105	1.22E+00	no data	no data	8.99E-01	1.57E+04	4.84E+04	no data	4.10E-01
RU-106	8.68E+04	no data	no data	1.07E+05	1.16E+07	1.64E+05	no data	1.09E+04
AG-110M	9.98E+03	7.22E+03	no data	1.09E+04	3.67E+06	3.30E+04	no data	5.00E+03
TE-125M	4.76E+03	1.99E+03	1.52E+03	no data	4.47E+05	1.29E+04	no data	6.58E+02
TE-127M	1.67E+04	6.90E+03	4.87E+03	3.75E+04	1.31E+06	2.73E+04	no data	2.07E+03
TE-127	2.23E+00	9.53E-01	1.85E+00	4.86E+00	1.04E+04	2.44E+04	no data	4.89E-01
TE-129M	1.41E+04	6.09E+03	5.47E+03	3.18E+04	1.68E+06	6.90E+04	no data	2.23E+03
TE-129	7.88E-02	3.47E-02	6.75E-02	1.75E-01	3.00E+03	2.63E+04	no data	1.88E-02

I-130	6.36E+03	1.39E+04	1.60E+06	1.53E+04	no data	1.99E+03	no data	5.57E+03
I-131	3.79E+04	4.44E+04	1.48E+07	5.18E+04	no data	1.06E+03	no data	1.96E+04
TE-131M	1.07E+02	5.50E+01	8.93E+01	2.65E+02	1.99E+05	1.19E+05	no data	3.63E+01
TE-131	1.74E-02	8.22E-03	1.58E-02	3.99E-02	2.06E+03	6.22E+03	no data	5.00E-03
I-132	1.69E+03	3.54E+03	1.69E+05	3.95E+03	no data	1.90E+03	no data	1.26E+03
TE-132	3.72E+02	2.37E+02	2.79E+02	1.04E+03	3.40E+05	4.41E+04	no data	1.76E+02
I-133	1.32E+04	1.92E+04	3.56E+06	2.24E+04	no data	2.16E+03	no data	5.60E+03
CS-134	3.96E+05	7.03E+05	no data	1.90E+05	7.97E+04	1.33E+03	no data	7.45E+04
I-134	9.21E+02	1.88E+03	4.45E+04	2.09E+03	no data	1.29E+03	no data	6.65E+02
I-135	3.86E+03	7.60E+03	6.96E+05	8.47E+03	no data	1.83E+03	no data	2.77E+03
CS-136	4.83E+04	1.35E+05	no data	5.64E+04	1.18E+04	1.43E+03	no data	5.29E+04
CS-137	5.49E+05	6.12E+05	no data	1.72E+05	7.13E+04	1.33E+03	no data	4.55E+04
CS-138	5.05E+02	7.81E+02	no data	4.10E+02	6.54E+01	8.76E+02	no data	3.98E+02
BA-139	1.48E+00	9.84E-04	no data	5.92E-04	5.95E+03	5.10E+04	no data	4.30E-02
BA-140	5.60E+04	5.60E+01	no data	1.34E+01	1.60E+06	3.84E+04	no data	2.90E+03
LA-140	5.05E+02	2.00E+02	no data	no data	1.68E+05	8.48E+04	no data	5.15E+01
BA-141	1.57E-01	1.08E-04	no data	6.50E-05	2.97E+03	4.75E+03	no data	4.97E-03
CE-141	2.77E+04	1.67E+04	no data	5.25E+03	5.17E+05	2.16E+04	no data	1.99E+03
BA-142	3.98E-02	3.30E-05	no data	1.90E-05	1.55E+03	6.93E+02	no data	1.96E-03
LA-142	1.03E+00	3.77E-01	no data	no data	8.22E+03	5.95E+04	no data	9.04E-02
CE-143	2.93E+02	1.93E+02	no data	5.64E+01	1.16E+05	4.97E+04	no data	2.21E+01
PR-143	1.40E+04	5.24E+03	no data	1.97E+03	4.33E+05	3.72E+04	no data	6.99E+02
CE-144	3.19E+05	1.21E+06	no data	5.38E+05	9.84E+06	1.48E+05	no data	1.76E+05
PR-144	4.79E-02	1.85E-02	no data	6.72E-03	1.61E+03	4.28E+03	no data	2.41E-03
ND-147	7.94E+03	8.13E+03	no data	3.15E+03	3.22E+05	3.12E+04	no data	5.00E+02
W-187	1.30E+01	9.02E+00	no data	no data	3.96E+04	3.56E+04	no data	3.11E+00
NP-239	3.71E+02	3.32E+01	no data	6.62E+01	5.95E+04	2.49E+04	no data	1.88E+01
U-232	3.60E+08	no data	no data	3.36E+07	2.09E+09	6.10E+04	no data	2.98E+007
U-233	7.62E+07	no data	no data	1.53E+07	4.98E+08	5.64E+04	no data	5.36E+06
U-234	7.31E+07	no data	no data	1.50E+07	4.89E+08	5.53E+04	no data	5.25E+06
U-235	7.01E+07	no data	no data	1.41E+07	4.59E+08	7.03E+04	no data	4.93E+06
U-236	7.01E+07	no data	no data	1.44E+07	4.69E+08	5.19E+04	no data	5.04E+06
U-237	4.55E+02	no data	no data	1.13E+03	1.28E+05	1.83E+04	no data	1.21E+02
U-238	6.71E+07	no data	no data	1.32E+07	4.28E+08	4.96E+04	no data	4.61E+06
NP-237	4.03E+09	2.39E+09	no data	1.08E+09	4.89E+08	7.14E+04	no data	1.76E+08
NP-238	3.74E+03	8.47E+02	no data	2.06E+02	1.29E+05	3.61E+04	no data	5.82E+01
PU-238	3.77E+09	2.35E+09	no data	6.50E+08	1.26E+09	6.57E+04	no data	1.78E+08
PU-239	4.10E+09	2.46E+09	no data	6.93E+08	1.19E+09	5.99E+04	no data	1.88E+08
PU-240	4.10E+09	2.45E+09	no data	6.92E+08	1.19E+09	6.10E+04	no data	1.88E+08
PU-241	1.18E+08	2.59E+07	no data	1.61E+07	1.07E+06	1.26E+03	no data	4.35E+06
PU-242	3.81E+09	2.37E+09	no data	6.68E+08	1.14E+09	5.88E+04	no data	1.81E+08
PU-244	4.44E+09	2.72E+09	no data	7.64E+08	1.31E+09	8.76E+04	no data	2.07E+08
AM-241	4.41E+09	2.73E+09	no data	1.11E+09	5.68E+08	6.69E+04	no data	1.83E+08
AM-242M	4.55E+09	2.60E+09	no data	1.12E+09	2.30E+09	8.41E+04	no data	1.89E+08
AM-243	4.34E+09	2.63E+09	no data	1.08E+09	5.39E+08	7.84E+04	no data	1.78E+08
CM-242	1.79E+08	1.21E+08	no data	2.37E+07	4.16E+08	7.14E+04	no data	7.98E+06
CM-243	3.46E+09	2.13E+09	no data	5.47E+08	5.94E+08	7.03E+04	no data	1.48E+08
CM-244	2.90E+09	1.78E+09	no data	4.49E+08	5.71E+08	6.80E+04	no data	1.24E+08
CM-245	4.51E+09	2.74E+09	no data	7.32E+08	5.49E+08	6.34E+04	no data	1.90E+08
CM-246	4.48E+09	2.74E+09	no data	7.32E+08	5.59E+08	6.23E+04	no data	1.90E+08
CM-247	4.35E+09	2.70E+09	no data	7.21E+08	5.49E+08	8.19E+04	no data	1.86E+08
CM-248	3.61E+10	2.23E+10	no data	5.94E+09	4.52E+09	1.32E+06	no data	1.54E+09
CF-252	3.32E+09	no data	no data	no data	1.92E+09	2.59E+05	no data	1.41E+08

TABLE IV.C.3
Ri CONSTANTS GROUND PLANE PATHWAY
(mrem/yr per μCi/m³)

AG-110M	3.44E+09
AM-241	6.85E+08
AM-242M	9.61E+07
AM-243	5.03E+09
BA-139	1.06E+05
BA-140	2.05E+07
BA-141	4.18E+04
BA-142	4.49E+04
BR-83	4.87E+03
BR-84	2.03E+05
BR-85	no data
C-14	no data
CE-141	1.37E+07
CE-143	2.31E+06
CE-144	6.96E+07
CF-252	4.83E+10
CM-242	6.85E+05
CM-243	7.05E+09
CM-244	7.84E+06
CM-245	3.67E+09
CM-246	3.86E+06
CM-247	8.51E+09
CM-248	2.63E+10
CO-58	3.79E+08
CO-60	2.32E+10
CR-51	4.66E+06
CS-134	6.91E+09
CS-136	1.50E+08
CS-137	1.30E+10
CS-138	3.59E+05
CU-64	6.07E+05
FE-55	no data
FE-59	2.72E+08
H-3	no data
I-130	5.51E+06
I-131	1.73E+07
I-132	1.23E+06
I-133	2.45E+06
I-134	4.46E+05
I-135	2.52E+06
LA-140	1.92E+07
LA-142	7.60E+05
MN-54	1.38E+09
MN-56	9.04E+05

MO-99	3.99E+06
NA-24	1.19E+07
NB-95	1.37E+08
ND-147	8.40E+06
NI-63	
NI-65	2.97E+05
NP-237	5.42E+09
NP-238	4.53E+06
NP-239	1.71E+06
P-32	no data
PR-143	no data
PR-144	1.83E+03
PU-238	4.65E+06
PU-239	3.06E+06
PU-240	5.02E+06
PU-241	1.14E+07
PU-242	4.26E+06
PU-244	3.46E+09
RB-86	8.97E+06
RB-88	3.31E+04
RB-89	1.23E+05
RU-103	1.08E+08
RU-105	6.36E+05
RU-106	4.22E+08
SB-124	5.98E+08
SB-125	2.38E+09
SR-89	2.16E+04
SR-90	no data
SR-91	2.15E+06
SR-92	7.77E+05
TC-101	2.04E+04
TC-99M	1.84E+05
TE-125M	1.55E+06
TE-127	2.98E+03
TE-127M	9.17E+04
TE-129	2.62E+04
TE-129M	1.98E+07
TE-131	2.92E+04
TE-131M	8.03E+06
TE-132	4.23E+06
U-232	9.12E+06
U-233	8.90E+09
U-234	2.45E+06
U-235	1.24E+10
U-236	8.13E+04
U-237	5.16E+07
U-238	4.26E+08
W-187	2.36E+06
Y-90	4.49E+03
Y-91	1.07E+06

Y-91M	1.00E+05
Y-92	1.80E+05
Y-93	1.83E+05
ZN-65	7.46E+08
ZN-69	no data
ZR-95	2.45E+08
ZR-97	2.96E+06

IV.D ODCMS 4.8.C.5.1

The projected doses from releases of gaseous effluents to areas at and beyond the SITE BOUNDARY shall be calculated in accordance with the following sections of this manual:

a. gamma air dose - IV.B.1
b. beta air dose - IV.B.2
c. organ dose - IV.C

The projected dose calculation shall be based on expected release from plant operation. The normal release pathways result in the maximum releases from the plant. Any alternative release pathways result in lower releases and, therefore, lower doses.

IV.E Technical Requirements Manual Test Requirement (TR) 3.5.3

IV.E.1 The recombiner hydrogen analyzers currently used at Peach Bottom are Whittaker Electrochemical type. (Analyzers 4083A and 4083B on Unit 2. Analyzers 5083A and 5083B on Unit 3.)

IV.E.2 The calibration gas for the Whittaker Analyzers is 2% Hydrogen, Balance Air.

IV.F ODCMS 4.8.C.7.1 and 4.8.C.7.2

IV.F.1 The dose rate in areas at and beyond the SITE BOUNDARY due to radioactive materials released in gaseous effluents from the incineration of waste oil from the auxiliary boilers shall be calculated by the equation in IV.A.2.

The dose rate from radioactive particulate release shall be determined by either of two methods. Method (a), total instantaneous release assumes that the total activity contained in the waste oil is released in the first minute of incineration. Method (b) uses the activity release over the entire time of incineration.

For normal operations, it is assumed that Method (a) will be used, since the total activity from the waste oil is expected to contribute an insignificant dose compared to the annual limits. However, in the event that the activity is significantly higher than administrative or regulatory limits, then Method (b) would be used because it is more accurate in calculating the dose rate.

Since the auxiliary boiler stacks are at approximately the same height as the reactor vents and discharge from the auxiliary boilers will also be heated, the use of the reactor vent D/Q value for the calculations is considered conservative.

IV.F.2 The dose to an individual from radioactive materials in particulate form and radionuclides other than noble gases with half-lives greater than eight days in gaseous effluents released to areas at and beyond the SITE BOUNDARY from the incineration of contaminated waste oil from the auxiliary boiler stacks shall be calculated by the equation in IV.C.

V.A. ODCMS 4.8.D.1.1 and 4.8.D.1.2

V.A.1 ODCMS 4.8.D.1.1

The total gaseous and liquid cumulative dose contributions are limited by ODCMS 3.8.D.1 to 3.0 mrem for whole body and critical organ, and 55 mrem for the thyroid to preserve assumptions set forth in the 10CFR72.212 report for the TN-68 spent fuel casks that are stored on the Independent Spent Fuel Storage (ISFSI) pad. Exceeding these action levels does not necessarily result in the overall 40CFR190 or 10CFR72.104 requirements not being met. Further calculations are required to determine compliance.

Whole Body

The whole body dose contribution from liquid and gaseous effluents shall be determined by the following method:

$$D_{wb} = D_l + D_\gamma$$

where:

D_{wb} = whole body dose from liquid and gaseous effluents, in mrem.

D_l = cumulative dose commitment to the total body from liquid effluents, in mrem (Determined by ODCM Section III.B).

D_γ = gamma air dose, in mrad (Determined by ODCM Section IV.B, with mrad equivalent to mrem).

Critical organ(except thyroid)

The critical organ(except thyroid) dose contribution from liquid and gaseous effluents shall be determined by the following method:

$$D_{co} = D_r + D_\gamma + D$$

where:

D_{co} = critical organ(except thyroid) dose from liquid and gaseous effluents, in mrem.

D_r = cumulative dose commitment to any organ from liquid effluents, in mrem (Determined by ODCM Section III.B).

D_γ = gamma air dose, in mrad (Determined by ODCM Section IV.B, with mrad equivalent to mrem).

D = limiting dose to the critical organ(except thyroid), in mrem (Determined by ODCM Section IV.C).

Thyroid

The thyroid dose contribution from gaseous effluents shall be determined by the following method:

$$D_{thy} = D_r + D_\gamma + D$$

where:

D_{thy} = thyroid dose from gaseous effluents, in mrem.

D_r = cumulative dose commitment to any organ from liquid effluents, in mrem (Determined by ODCM Section III.B).

D_γ = gamma air dose, in mrad (Determined by ODCM Section IV.B, with mrad equivalent to mrem).

D = limiting dose to the thyroid, in mrem (Determined by ODCM Section IV.C).

V.A.2 ODCMS 4.8.D.1.2

The cumulative dose from all sources(i.e. gas and liquid effluents and direct radiation) is calculated by summing the individual doses obtained in ODCMS 4.8.D.1.1 for whole body(D_{WB}), critical organ(D_{CO}) and thyroid(D_{Th}) with the TLD measured dose(mrem) minus the background dose.

Whole Body

The cumulative whole body dose from liquid, gas and direct radiation shall be determined by the following method:

$$D_{WB}^{Total} = D_{WB} + D_{D}$$

where:

D_{WB}^{Total} = whole body dose equivalent from all sources, in mrem.

D_{WB} = whole body dose from liquid and gaseous effluents, in mrem.

D_{D} = Dose from direct radiation, in mrem(after subtracting background).

Critical Organ(except thyroid)

The cumulative critical organ(except thyroid) dose from liquid, gas and direct radiation shall be determined by the following method:

$$D_{CO}^{Total} = D_{CO} + D_{D}$$

where:

D_{CO}^{Total} = critical organ(except thyroid) dose equivalent from all sources, in mrem.

D_{CO} = critical organ(except thyroid) dose from liquid and gaseous effluents, in mrem.

D_{D} = Dose from direct radiation, in mrem(after subtracting background).

Thyroid

The cumulative thyroid dose from gas and direct radiation shall be determined by the following method:

$$D_{Thy}^{Total} = D_{Thy} + D_D$$

where:

D_{Thy}^{Total} = thyroid dose equivalent from all sources, in mrem.

D_{Thy} = thyroid dose from gaseous effluents, in mrem.

D_D = Dose from direct radiation, in mrem(after subtracting background).

The dose contribution is calculated at the discharge point for liquids and in the worst sector for gases. If necessary, the dose contribution from liquid and gas may be calculated for a real individual.

VI.A ODCMS 4.8.E.1.1 and 4.8.E.1.2

The radiological environment monitoring samples shall be collected pursuant to Table VII.A.1 from the locations shown on Figures VII.A.1, VII.A.2, and VII.A.3, and shall be analyzed pursuant to the requirements of Table VII.A.1.

TABLE VII.A-1

ODCM - Peach Bottom Atomic Power Station
Radiological Environmental Monitoring Program

Pathway	Station Code	Distance and Direction from PBAPS Vents	Collection Method and Discussion	Analyses
I. Direct Radiation				
Site Boundary	1L	1,256 feet NE of site	1 set of four (4) TLDs from each location at least quarterly Gamma dose quarterly TLD sites were chosen in accordance with Peach Bottom ODCMS Table 4.8.E.1 Item 1. Site Boundary stations all sectors except several along Conowingo Pond. These sectors are monitored by stations on the east side of Conowingo Pond. The 5 mile vicinity stations cover all sectors. The distant and special interest stations provide information in population centers and control locations.	Gamma Dose quarterly
	1A	1,396 feet SE of site		
	2	4,661 feet SE of site		
	1I	2,851 feet SSE of site		
	1C	4,513 feet SSE of site		
	1J	3,755 feet S of site		
	1F	2,707 feet SSW of site		
	40	7,050 feet SW of site		
	1NN	2,547 feet WSW of site		
	1H	3,104 feet W of site		
	1G	3,173 feet WNW of site		
	1B	2,587 feet NW of site		
	1E	3,136 feet NNW of site		
	1K	4604 feet SW of site		
Intermediate Distance	15	19,449 feet N of site		
	22	13,230 feet NNE of site		
	44	27,480 feet NE of site		
	32	15,213 feet ENE of site		
	45	18,524 feet ENE of site		
	14	10,397 feet E of site		
	17	21,966 feet ESE of site		
	31A	24,105 feet SE of site		
	4K	45,721 feet SE of site		
	23	5,276 feet SSE of site		
	27	13,859 feet S of site		
	48	25,772 feet SSW of site		
	3A	19,114 feet SW of site		
	49	20,673 feet WSW of site		

TABLE VII.A-1

ODCM - Peach Bottom Atomic Power Station
Radiological Environmental Monitoring Program

Pathway	Station Code	Distance and Direction from PBAPS Vents	Collection Method and Discussion	Analyses
	50	25,677 feet W of site		
	51	20,511 feet WNW of site		
	26	22,093 feet NW of site		
	6B	30,538 feet NW of site		
	42	21,954 feet NNW of site		
Distant and Special Interest	43	26,931 feet NNE of site		
	5	24,482 feet E of site		
	16	67,788 feet E of site		
	24	58,048 feet ESE of site		
	2B	3,768 feet SSE of site		
	46	23,483 feet SSE of site		
	47	22,153 feet S of site		
	18	51,413 feet W of site		
	19 C	106,354 feet WNW of site		
II. Airborne				
Particulates	1Z	1,396 feet SE of site	Approximately 1 cfm continuous flow through glass fiber filter which is collected weekly.	Gross beta analysis on each weekly sample. Gamma spectrometry shall be done when gross beta exceeds ten times the yearly mean of control station value.
	1B	2,587 feet NW of site		
	1C	4,513 feet SSE of site		
	3A	19,114 feet SW of site		
	5H2 C	162,565 feet NE of site	These stations provide for coverage of the highest annual average ground level D/Q near the site	Gross beta analysis done ≥24 hr after

TABLE VII.A-1

ODCM - Peach Bottom Atomic Power Station
Radiological Environmental Monitoring Program

Pathway	Station Code	Distance and Direction from PBAPS Vents	Collection Method and Discussion	Analyses
			boundary, the community with the highest annual average D/Q and a control location.	sampling to allow for Radon and Thoron daughter decay. Gamma Spec on quarterly composite by location.
Iodine	1Z	1,396 feet SE of site	A TEDA impregnated flow-through cartridge is connected to air sampler and is collected weekly at site filter change.	Iodine 131 weekly
	1B	2,587 feet NW of site		
	1C	4,513 feet SSE of site		
	3A	19,114 feet SW of site		
	5H2 C	162,565 feet NE of site		
III. Waterborne				
Surface	1LL C	1,256 feet NE of site	Sample collected from a continuous water sampler, monthly. In event sampler is inoperable, grab samples will be collected each	Gamma isotopic analysis monthly; H-3 on quarterly composite
	1MM	5,470 feet SE of site		

TABLE VII.A-1

ODCM - Peach Bottom Atomic Power Station
Radiological Environmental Monitoring Program

Pathway	Station Code	Distance and Direction from PBAPS Vents	Collection Method and Discussion	Analyses
			calendar day until sampler returned to service.	
Drinking	4L 6I C	45,721 feet SE of site 30,337 feet NW of site	Sample collected from a continuous water sampler monthly. In event sampler is inoperable, weekly grab samples will be collected until sampler returned to service.	Gross beta and gamma isotopic monthly, H-3 on quarterly composite
Sediment	4J	7,346 feet SE of site	A sediment sample is taken down stream of discharge semi-annually.	Gamma isotopic analysis each sample
IV. Ingestion				
Milk	V C J R U	32,736 feet W of site 5,119 feet W of site 4,694 feet WSW of site 11,414 feet SSW of site	Sample of fresh milk is collected from each farm biweekly when cows are on pasture (April through October), monthly at other times.	I-131 analyses on each sample Gamma isotopic analysis or Cs-134, -137 by chemical separation quarterly
Fish	4	7,162 feet SE of site	Two species of	Gamma isotopic analyses

TABLE VII.A-1

ODCM - Peach Bottom Atomic Power Station
Radiological Environmental Monitoring Program

Pathway	Station Code	Distance and Direction from PBAPS Vents	Collection Method and Discussion	Analyses
	6 C	57,347 feet NW of site	recreationally important fish (predator and bottom feeder) sampled in season or semiannually if not seasonal.	on edible portions.
Food Products		Two offsite locations of highest predicted annual average ground level D/Q and one location (15-30 km distance) in the least prevalent wind direction as determined using the results of the most recent annual Land use Survey.	Samples of three (3) different kinds of broad leaf vegetation monthly when available if milk sampling is not performed	Gamma isotopic and I-131 analysis

C = Control Location

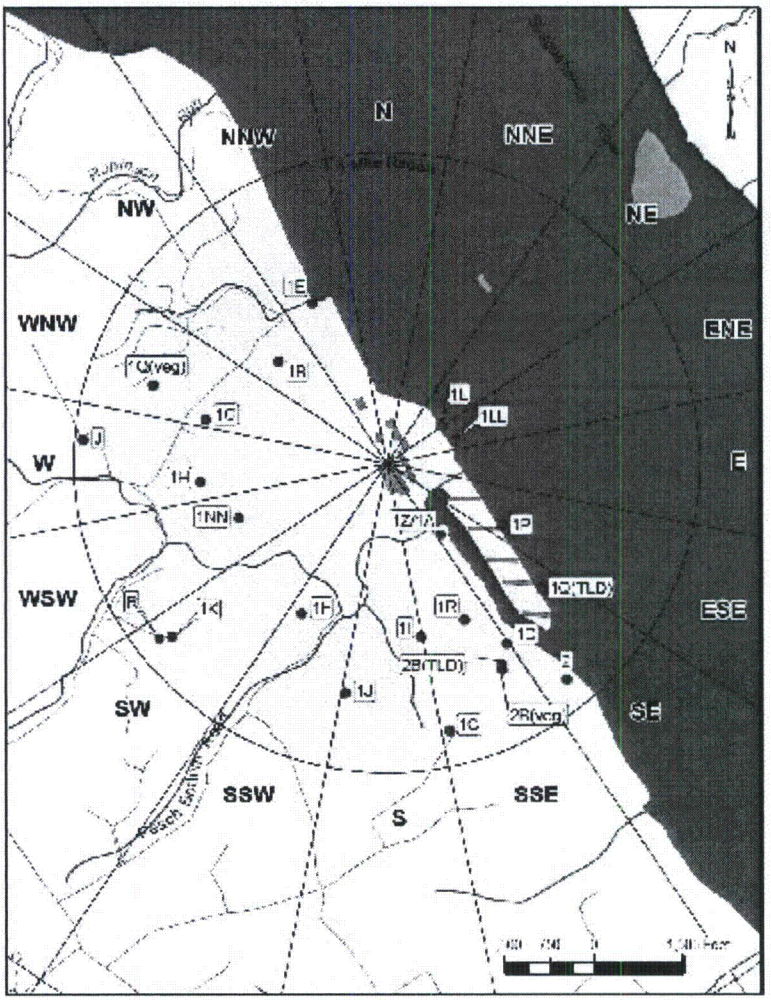

FIGURE VII.A.1
ENVIRONMENTAL SAMPLING STATIONS AT
SITE BOUNDARY AREA TO PEACH BOTTOM

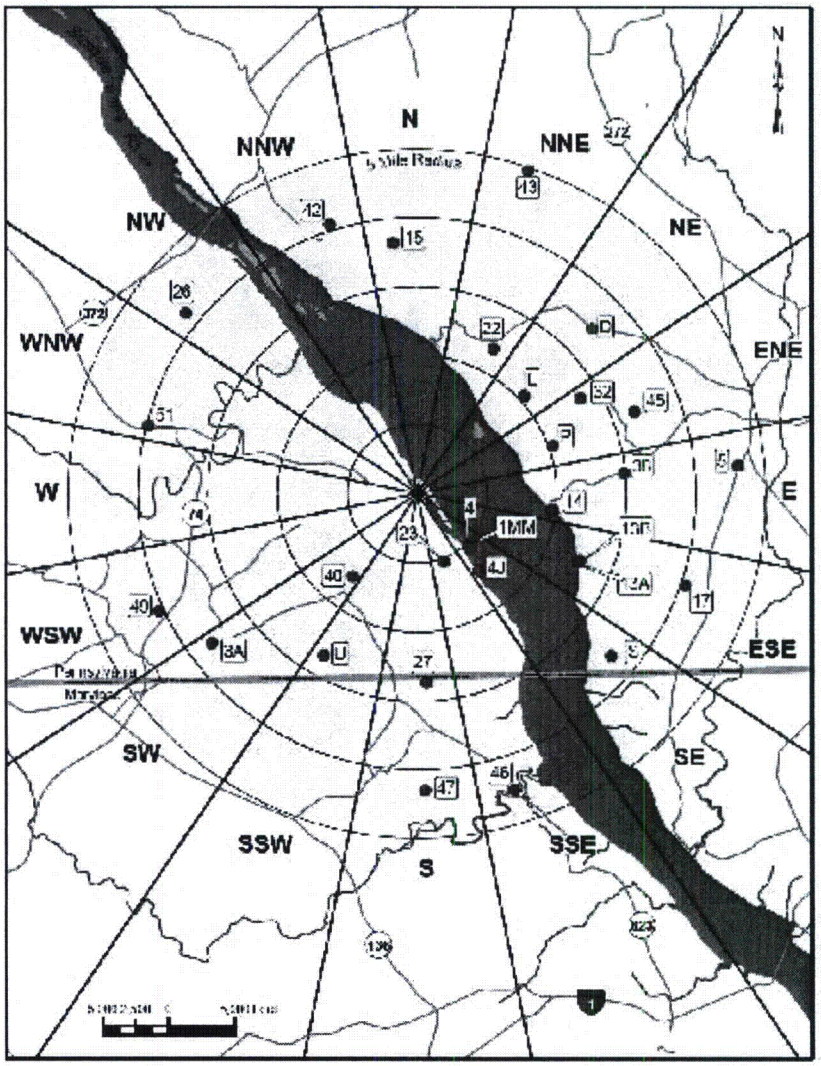

FIGURE VII.A.2
ENVIRONMENTAL SAMPLING STATIONS AT
INTERMEDIATE DISTANCES FROM PEACH BOTTOM SITE

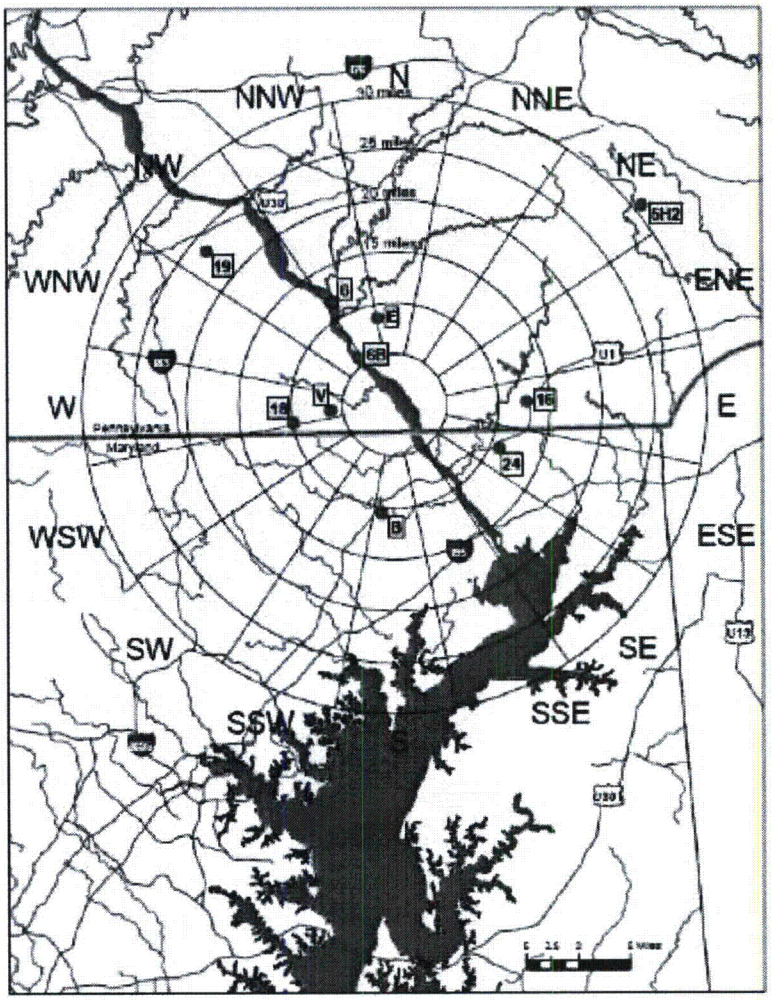

FIGURE VII.A.3
ENVIRONMENTAL SAMPLING STATIONS AT
REMOTE DISTANCES FROM PEACH BOTTOM SITE

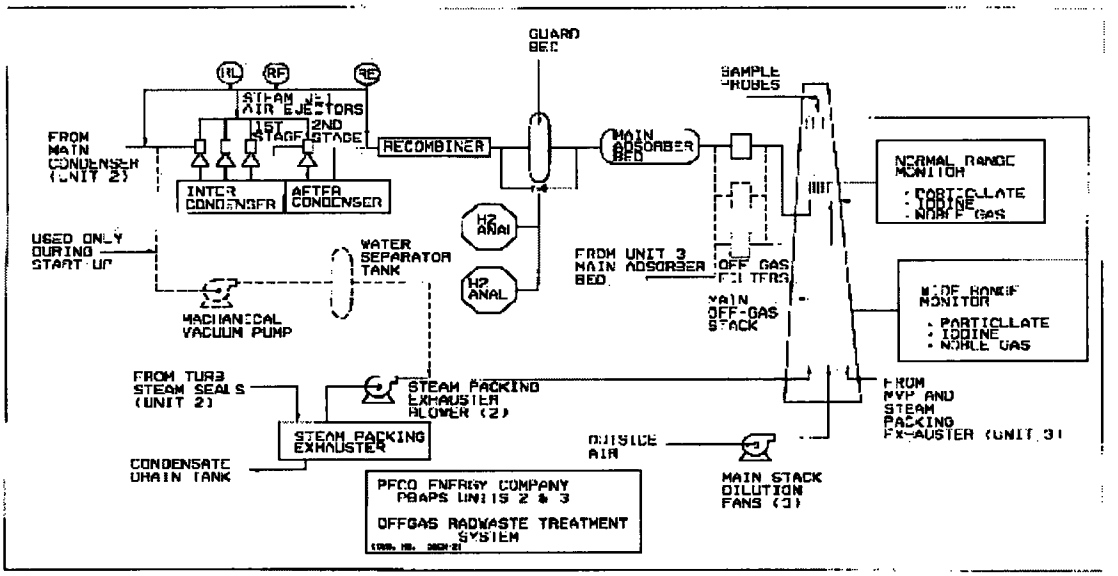
GUARD BED
SAMPLE PROBES
STEAM JET AIR EJECTORS
1ST STAGE
2ND STAGE
RECOMBINER
MAIN ADSORBER BED
FROM MAIN CONDENSER (UNIT 2)
INTER CONDENSER
AFTER CONDENSER
NORMAL RANGE MONITOR
: PARTICULATE
: IODINE
: NOBLE GAS
H2 ANAL
H2 ANAL
USED ONLY DURING START UP
WATER SEPARATOR TANK
FROM UNIT 3 MAIN ADSORBER BED
OFF GAS FILTERS
MAIN OFF-GAS STACK
WIDE RANGE MONITOR
: PARTICULATE
: IODINE
: NOBLE GAS
MECHANICAL VACUUM PUMP
FROM TURB STEAM SEALS (UNIT 2)
STEAM PACKING EXHAUSTER BLOWER (2)
STEAM PACKING EXHAUSTER
FROM MVP AND STEAM PACKING EXHAUSTER (UNIT 3)
OUTSIDE AIR
CONDENSATE DRAIN TANK
MAIN STACK DILUTION FANS (3)
PECO ENERGY COMPANY
PBAPS UNITS 2 & 3
OFFGAS RADWASTE TREATMENT SYSTEM

Figure 1

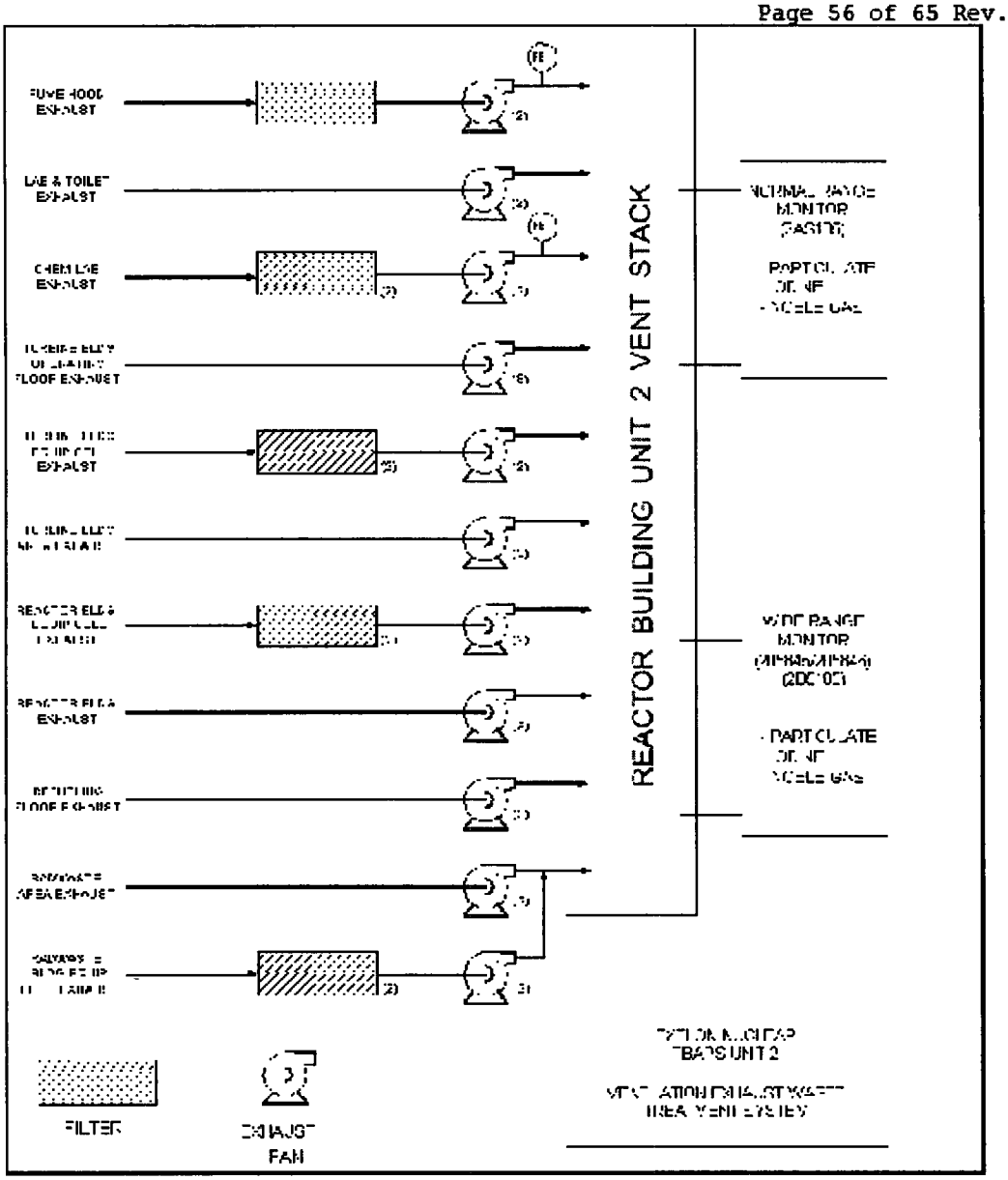

Figure 2

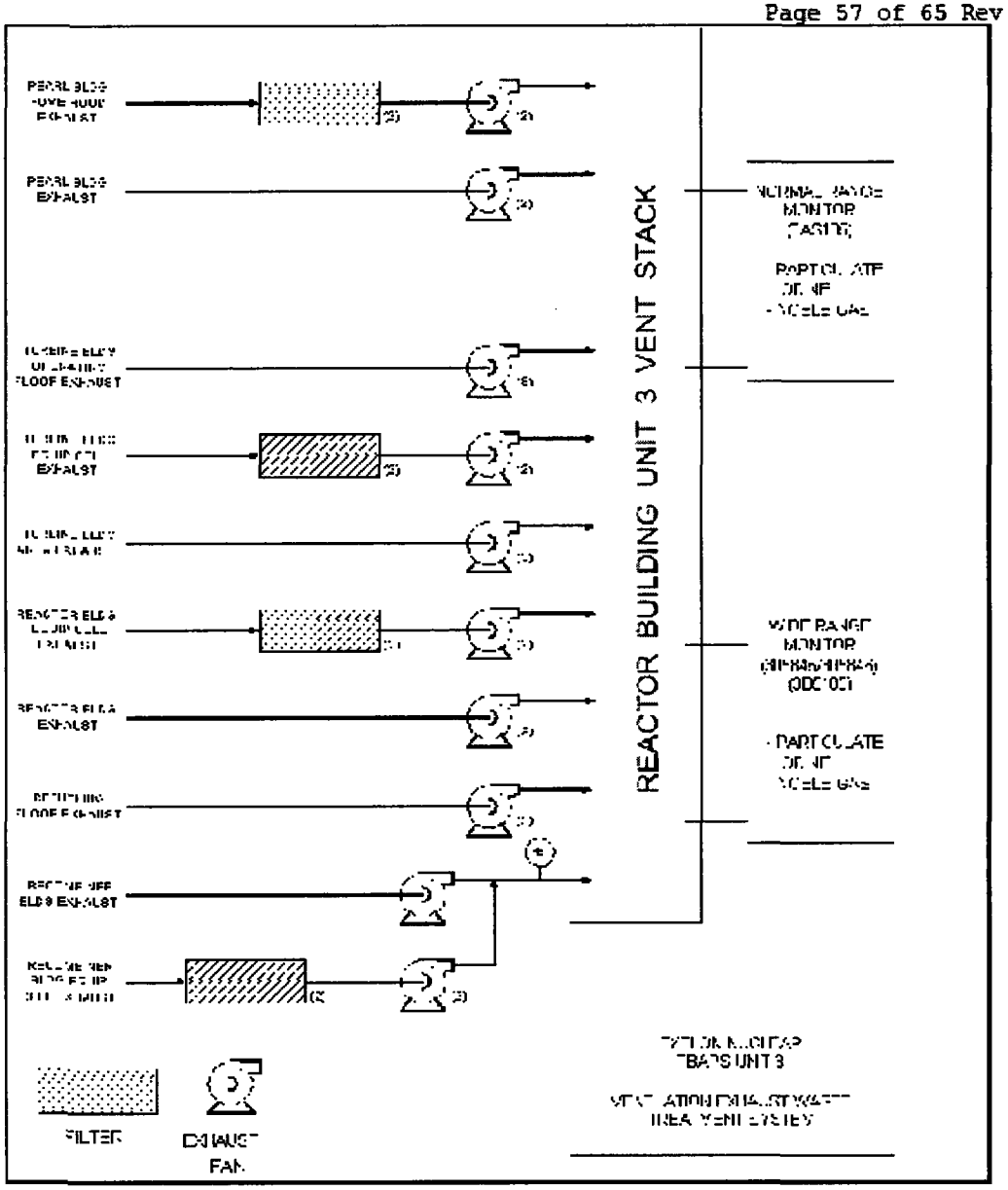

Figure 3

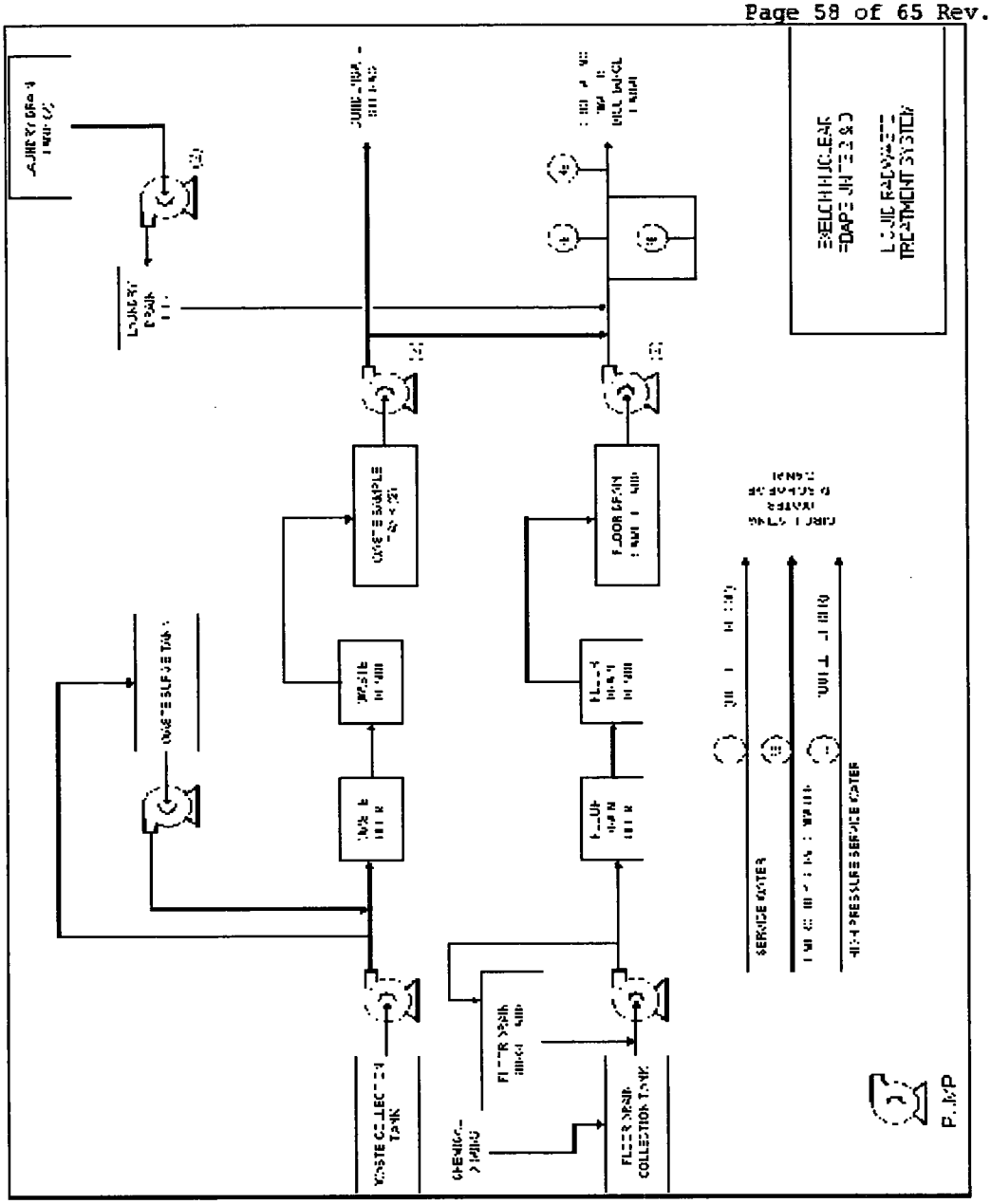

Figure 4

VII. Bases

Liquid Effluent Release Flow Rate Determination

Non-gamma emitting radionuclides (H-3, Fe-55, Sr-89/90) are not detected by the effluent monitor and , therefore, are not directly included in the release flow rate determination. While tritium accounts for nearly all the activity released, it is not a significant contributor when determining the permissible flow rate. Examining releases over the years 2004 - 2006, the average diluted H-3 contribution to its limiting concentration in liquid effluents was 0.03%. This contribution is not expected to change significantly over time, since the concentration of H-3 in effluents can be expected to remain fairly consistent in effluent releases regardless of fuel conditions, activation product releases, and waste processing.

Based on relative abundances, other non-gamma emitting radionuclides only contributed up to nearly 3 % of the concentration limit. It is reasonable to assume that the abundances of these non-gamma will remain the same relative to other fission and/or activation products under varying conditions. Therefore, under conditions of elevated effluent radionuclide levels, the gamma-emitting radionuclides can be expected to be the main contributors to limiting conditions on liquid effluent concentrations. The maximum permissible release flow rate determination methodology presented in III.A offers an additional factor of conservatism of 30 to 50 which is more than adequate to account for the non-gamma emitting radionuclides.

Site Specific Data

NOTE 1

Liquid dose factors, $A_{i\tau}$, for section III.B were developed using the following site specific data. The liquid pathways involved are drinking water and fish.

$$A_{i\tau} = (U_w / D_w + U_F x BF_i) k_o x DF_i x RC x e^{-\lambda_i \Delta t}$$

U_w = liters per year; maximum age group usage of drinking water (Reg. Guide 1.109, Table E-5)

D_w = 5.4; average annual dilution at Conowingo intake

U_F = kg per year; maximum age group usage of fish (Reg. Guide 1.109, Table E-5)

BF_i = bioaccumulation factor for nuclide, i, in freshwater fish. Reg. Guide 1.109, Table A-1, except P-32 which uses a value of 3.0×10^3 pCi/kg per pCi/liter.

k_0 = 1.14×10^5 = (10^6 pCi/μCi x 10^3 ml/l)/ 8760 hr/yr) units conversion factor.

DF_i = dose conversion factor for nuclide, i, for the age group in total body or organ, as applicable. Reg. Guide 1.109, Table E-11, except P-32 bone which uses a value as indicated below.

3.0×10^{-5} mrem/pCi

RC = 1.16; reconcentration from PBAPS discharge back through PBAPS intake.

λ_i = decay constant for nuclide i, hr^{-1}

The data for D_w and RC were derived from data published in Peach Bottom Atomic Power Station Units 2 and 3 (Docket Nos. 50-277 and 50-278) Radioactive Effluent Dose Assessment, Enclosure A, September 30, 1976. All other data except P-32 BF and DF were used as given in Reg. Guide 1.109, Revision 1, October 1977. The P-32 BF and DF were used in accordance with information supplied in Branagan, E.F., Nichols, C.R., and Willis, C.A., "The Importance of P-32 in Nuclear Reactor Liquid Effluents", NRC, 6/82. The teen and child dose factors were derived by the ratio of the adult bone dose factors in Reg. Guide 1.109 and Branagan, et al.

NOTE 2

To develop constant R for the ingestion pathway in section IV.C, the following site specific data were used:

$$R_i^C(D/Q) = K \frac{Q_F(U_{ap})}{\lambda_i + \lambda_w} F_m(r)(DFL_i)\left[\frac{f_p f_s}{Y_p} + \frac{(1 - f_p f_s)e^{-\lambda_i t_h}}{Y_s}\right] e^{-\lambda_i t_f}$$

where:

K = 10^6 pCi/μCi; unit conversion factor

Q_F = 50 kg/day; cow's consumption rate

U_{ap} = 330 l/yr; yearly milk consumption by an infant

λ_i = radioactive decay constant for nuclide of interest, sec^{-1} (e.g. 9.97×10^{-7} sec^{-1} for I-131)

λ_w = 5.73×10^{-7} sec^{-1}; decay constant for removal of activity in leaf and plant surfaces

F_m = stable element transfer coefficient for nuclide of interest, day/liter (e.g. 6.0×10^{-3} day/liter for I-131)

r = fraction of deposited nuclide retained in cow's feed grass, 1.0 for radioiodine; 0.2 for particulates

DFL_i = ingestion dose factor in infant for nuclide of interest, mrem/pCi (e.g. 1.39×10^{-2} mrem/pCi for I-131)

f_p = 0.6; the fraction of the year the cow is on pasture (average of all farms)

f_s = 0.487; the fraction of cow feed that is pasture grass while the cow is on pasture (average of all farms)

Y_p = 0.7 kg/m^2; the agricultural productivity of pasture feed grass

Y_s = 2.0 kg/m^2; the agricultural productivity of stored feed

t_f = 1.73×10^5 sec (2 days); the transport time from pasture, to cow, to milk, to receptor

t_h = 7.78×10^6 sec (90 days); the transport time from pasture, to harvest, to cow, to milk, to receptor

NOTE 3

To develop constant R for tritium for the ingestion pathway in section IV.C, the following site specific data were used:

The concentration of tritium in milk is based on the airborne concentration rather than the deposition. The following additional constants and formula are used:

$$R^{C}_{H-3}(\chi/Q) = K'K''F_m Q_F U_{ap}(DFL_i)\left[0.75(0.5/H)\right]$$

where:

K'' = 10^3 gm/kg; a constant of unit conversion

H = 14.61 gm/m^3; absolute humidity of the atmosphere

0.75 = the fraction of total feed that is water

0.5 = the ratio of the specific activity of the feed grass water to the atmospheric water

The pathway is the grass-cow-milk ingestion pathway. These data were derived from data published in Peach Bottom Atomic Power Station Units 2 and 3 (Docket Nos. 50-277 and 50-278) Radioactive Effluent Dose Assessment, Enclosure A, September 30, 1976. All other data were used as given in Reg. Guide 1.109, Revision 1, October 1977.

ODCM S 4.8.B.2.1, Liquid Pathway Dose Calculations

The equations for calculating the doses due to the actual release rates of radioactive materials in liquid effluents were developed from the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part

50, Appendix I", Revision 1, October 1977 and NUREG-0133 "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants", October 1978.

ODCMS 4.8.C.1.1 and 4.8.C.1.2

Dose Rate Noble Gases

The equations for calculating the dose rate due to the actual release rates of radioactive noble gases in gaseous effluents were developed from the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Revision 1, October 1977, NUREG-0133 "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants", August 1978, and the atmospheric dispersion model presented in Information Requested in Enclosure 2 to letter from George Lear to E. G. Bauer dated February 17, 1976, September 30, 1976. The specified equations provide for determining the dose rates in areas at and beyond the SITE BOUNDARY based upon the historical average atmospheric conditions.

The dose rate due to noble gas release as calculated by the Gross Release Method is much more conservative than the dose calculated by the Isotopic Analysis Method. Assuming the release rates given in Radioactive Effluent Dose Assessment, September 30, 1976, the values calculated by the Gross Release Method for total body dose rate and skin dose rate are 6.0 times and 5.7 times, respectively, the values calculated by the Isotopic Analysis Method.

Dose Rate I-131, I-133, Tritium and Radioactive Material in Particulate Form.

The model Technical Specification LCO of NUREG-0133 for all radionuclides and radioactive materials in particulate form and radionuclides other than noble gases requires that the instantaneous dose rate be less than the equivalent of 1500 mrem per year.

The release data from 1994 to 1996 were evaluated and the critical organs were determined to be the child thyroid or teenager lung. The child thyroid dose rate is limiting when iodine releases exceed 10 percent of the total release rates. The teenager lung dose rate is limiting when iodine is either not present or a small fraction of the total release.

Because of good fuel performance the amount of I-131 released has decreased. The thyroid may not be the critical organ. When it is not clear which organ dose is limiting, doses for the child thyroid and teenage lung are calculated.

ODCMS 4.8.C.2.1

Dose Noble Gases

The equations for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents were developed from the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Revision 1, October 1977, NUREG-0133 "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants", August 1978, and the atmospheric dispersion model presented in Information Requested in Enclosure 2 to letter from George Lear to E. G. Bauer dated February 17, 1976, September 30, 1976. The specified equations provide for determining the air doses in areas at and beyond the SITE BOUNDARY based upon the historical average atmospheric conditions.

The dose due to noble gas releases as calculated by the Gross Release Method is much more conservative than the dose calculated by the Isotopic Analysis Method. Assuming the releases rates given in Radioactive Effluent Dose Assessment, September 30, 1976, the values calculated by the Gross Release Method for total body dose rate and skin dose rate are 4.3 times and 7.2 times, respectively, the values calculated by the Isotopic Analysis Method.

ODCMS 4.8.C.3.1

Dose, Iodine-131, Iodine-133, Tritium, and Radioactive Material in Particulate Form

The equation for calculating the doses due to the actual release of radioiodines, radioactive material in particulate form, and radionuclides other than noble gases with half-lives greater than 8 days were developed using the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Revision 1, October 1977, NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for

Nuclear Power Plants", October 1978, and the atmospheric dispersion model presented in Information Requested in Enclosure 2 to Letter from George Lear to E. G. Bauer dated February 17, 1976, September 30, 1976. These equations provide for determining the actual doses based upon the historical average atmospheric conditions.

Compliance with the 10 CFR 50 limits for radioiodines, radioactive materials in particulate form and radionuclides other than noble gases with half lives greater than eight days is to be determined by calculating the infant thyroid, infant liver and infant bone dose. These organs were determined to be the critical organs based on the release data from 1994 to 1996.

Because of a decrease in the amount of I-131 released, the thyroid may not be the critical organ. The isotopic analysis method is used to calculate dose to the infant thyroid, infant liver and infant bone.

Appendix C: Radioactive Waste Process Control Program Procedure

Exelon Nuclear

PROCESS CONTROL PROGRAM FOR RADIOACTIVE WASTES

1. PURPOSE

1.1. The purpose of the Process Control Program (PCP) is to:

1.1.1. Establish the process and boundary conditions for the preparation of specific procedures for processing, sampling, analysis, packaging, storage, and shipment of solid radwaste in accordance with local, state, and federal requirements. (CM-1)

1.1.2. Establish parameters which will provide reasonable assurance that all Low Level Radioactive Wastes (LLRW), processed by the in-plant waste process systems on-site OR by on-site vendor supplied waste processing systems, meet the acceptance criteria to a Licensed Burial Facility, as required by 10CFR Part 20, 10CFR Part 61, 10CFR Part 71, 49CFR Parts 171-172, "Technical Position on Waste Form (Revision 1)" [1/91], "Low-Level Waste Licensing Branch Technical Position on Radioactive Waste Classification" [5/83], and the Station Technical Specifications, as applicable.

1.1.3. Provide reasonable assurance that waste placed in "on-site storage" meets the requirements as addressed within the Safety Analysis Reports for the low level radwaste storage facilities for dry and/or processed wet waste.

2. TERMS AND DEFINITIONS

2.1. Process Control Program (PCP): The program which contains the current formulas, sampling, analysis, tests, and determinations to be made to ensure that processing and packaging of solid radioactive waste based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure the waste meets the stabilization criteria specified in 10CFR Parts 20, 61 and 71, state regulations, and burial site requirements.

2.2. Solidification: Liquid waste processed to either an unstable or stable form per 10CFR61 requirements. Waste solidified does not have to meet the 300-year free standing monolith criteria. Approved formulas, samples and tests do not have to meet NRC approval for wastes solidified in a container meeting stability criteria (e.g. High Integrity Container).

2.3. Stabilization: Liquid waste processed to a "stable state" per 10CFR61 Requirements. Established formulas, samples, and tests shall be approved by the NRC in order to meet solidification "stabilization" criteria. This processing method is currently not available, because the NRC recognizes that waste packed in a High Integrity Container meets the 300-year stabilization criteria. In the event that this processing method becomes an acceptable method, then the NRC shall approve the stabilization formulas, samples, tests, etc.

2.4. **Solidification Media:** An approved media (e.g. Barnwell - vinyl ester styrene, cement, bitumen) when waste containing nuclides with greater than 5-year half lives is solidified in a container with activity greater than 1 micro curie/cc. Waste solidified in a HIC is approved by the commission meeting the 10CFR61 stabilization criteria, including 1% free standing liquids by volume when the waste is packaged to a "stable" form and ≤ 0.5% when waste is packaged to an "unstable" form. The formulas, sampling, analysis, and test do not require NRC approval, because the HIC meets the stability criteria.

2.4.1. Solidification to an unstable or stable state is performed by vendors, when applicable. Liquid waste solidified to meet stabilization criteria (10CFR61 and 01-91 Branch Technical Requirements) shall have documentation available that demonstrates that the process is approved by the NRC or disposal facility.

2.5. **Dewatering:** The process of removing fluids from liquid waste streams to produce a waste form that meets the requirements of 10CFR Part 61 and applicable burial site criteria, ≤0.5% by volume when the waste is packaged to an "unstable" state, or ≤1% by volume when the waste is packaged to a "stable" form.

2.6. **High Integrity Container (HIC):** A disposable container that is approved to the Requirements of 10CFR61. The use of HIC's is an alternative to solidification or encapsulation in a steel container to meet burial stability. HIC's are used to package dewatered liquid wastes, (e.g. filter cartridges, filter media, resin, sludges, etc), or dry active waste.

2.7. **Encapsulation:** The process of placing a component (e.g. cartridge filters or mechanical components) into a special purpose disposable container and then completely surrounding the waste material with an approved stabilization media, such as cement.

2.8. **Liquid Waste Processing Systems:** In-plant or vendor supplied processing systems consisting of equipment utilized for evaporation, filtration, demineralization, dewatering, compression dewatering, solidification, or reverse osmosis (RO) for the treatment of liquid wastes (such as Floor Drains, Chemical Drains and Equipment Drain inputs).

2.9. **Incineration, RVR, and/or Glass Vitrification of Liquid or Solid:** Dry or wet waste processed via incineration and/or thermal processing where the volume is reduced by thermal means meets 10CFR61 requirements.

2.10. **Compaction:** When dry wastes such as paper, wood, plastic, cardboard, incinerator ash, and etc. are volume reduced through the use of a compactor.

2.11. **Waste Streams:** Consist of but are not limited to
- Filter media (powdered, bead resin and fiber),
- Filter cartridges,
- Pre-coat body feed material,
- Contaminated charcoal,

- Fuel pool activated hardware,
- Oil Dry absorbent material added to a container to absorb liquids
- Fuel Pool Crud
- Sump and tank sludges,
- High activity filter cartridges,
- Concentrated liquids,
- Contaminated waste oil,
- Dried sewage or wastewater plant waste,
- Dry Active Waste (DAW): Waste such as filters, air filters, low activity cartridge filters, paper, wood, glass, plastic, cardboard, hoses, cloth, and metals, etc, which have become contaminated as a consequence of normal operating, housekeeping and maintenance activities.
- Other radioactive waste generated from cleanup of inadvertent contamination.

3. RESPONSIBILITIES

3.1. Implementation of this Process Control Program (PCP) is described in procedures at each station and is the responsibility of the each site to implement.

4. MAIN BODY

4.1. Process Control Program Requirements

4.1.1. A change to this PCP (Radioactive Waste Treatment Systems) may be made provided that the change is reported as part of the annual radioactive effluent release report, Regulatory Guide 1.21, and is approved by the Plant Operations Review Committee (PORC).

4.1.2. Changes become effective upon acceptance per station requirements.

4.1.3. A solidification media, approved by the burial site, may be **REQUIRED** when liquid radwaste is solidified to a stable/unstable state.

4.1.4. When processing liquid radwaste to meet solidification stability using a vendor supplied solidification system:

1. If the vendor has its own Quality Assurance (QA) Program, then the vendor shall **ADHERE** to its own QA Program and shall have **SUBMITTED** its process system topical report to the NRC or agreement state.

2. If the vendor does not **HAVE** its own Quality Assurance Program, then the vendor shall **ADHERE** to an approved Quality Assurance Topical Report standard belonging to the Station or to another approved vendor.

4.1.5. The vendor processing system(s) is/are controlled per the following:

1. A commercial vendor supplied processing system(s) may be **USED** for the processing of LLRW streams.

2. Vendors that process liquid LLRW at the sites shall **MEET** applicable Quality Assurance Topical Report and Augmented Quality Requirements.

4.1.6. Vendor processing system(s) operated at the site shall be **OPERATED** and **CONTROLLED** in accordance with vendor approved procedures or station procedures based upon vendor approved documents.

4.1.7. All waste streams processed for burial or long term on-site storage shall **MEET** the waste classification and characteristics specified in 10CFR Part 61.55, Part 61.56, the 5-83 Branch Technical Position for waste classification, and the applicable burial site acceptance criteria (for any burial site operating at the time the waste was processed).

4.1.8. An Exelon Nuclear plant may store waste at another Exelon Nuclear plant, provided formal NRC approval has been **RECEIVED** for the transfer of waste.

4.2. General Waste Processing Requirements

NOTE: On-site resin processing involves tank mixing and settling, transferring to the station or vendor processing system via resin water slurry or vacuuming into approved waste containers, and, when applicable, dewatering for burial.

4.2.1. Vendor resin beds may be **USED** for decontamination of plant systems, such as, SFP (Spent Fuel Pool), RWCU (reactor water cleanup), and SDC (Shut Down Cooling). These resins are then **PROCESSED** via the station or vendor processing system.

4.2.2. Various drains and sump discharges will be **COLLECTED** in tanks or suitable containers for processing treatment. Water from these tanks may be **SENT** through a filter, demineralizer, concentrator or vendor supplied processing systems.

4.2.3. Process waste (e.g. filter media, sludges, resin, etc) will be periodically **DISCHARGED** to the station or vendor processing system for onsite waste treatment or **PACKAGED** in containers for shipment to offsite vendor for volume reduction processing.

4.2.4. Process water (e.g. chemical, floor drain, equipment drain, etc.) may be **SENT** to either the site waste processing systems or vendor waste processing systems for further filtration, demineralization for plant re-use, or discharge.

4.2.5. All dewatering and solidification/stabilization will be **PERFORMED** by either utility site personnel or by on-site vendors or will be **PACKAGED** and **SHIPPED** to an off-site vendor low-level radwaste processing facility.

4.2.6. Dry Active Waste (DAW) will be **HANDLED** and **PROCESSED** per the following:

1. DAW will be **COLLECTED** and **SURVEYED** and may be **SORTED** for compactable and non-compactable wastes.
2. DAW may be packaged in containers to facilitate on-site pre-compaction and/or off-site vendor contract requirements.
3. DAW items may be **SURVEYED** for release onsite or offsite when applicable.
4. Contaminated filter cartridges will be **PLACED** into a HIC or will be **ENCAPSULATED** in an in-situ liner for disposal or **SHIPPED** to an offsite waste processor in drums, boxes or steel liners per the vendor site criteria for processing and disposal.

4.2.7. Filtering devices using pre-coat media may be **USED** for the removal of suspended solids from liquid waste streams. The pre-coat material or cartridges from these devices may be routinely **REMOVED** from the filter vessel and discharged to a Filter Sludge Tank or Liner/HIC. Periodically, the filter sludge may be **DISCHARGED** to the vendor processing system for waste treatment onsite or **PACKAGED** in containers for shipment to offsite vendor for volume reduction processing.

4.2.8. Activated hardware stored in the Spent Fuel Pools will be **PROCESSED** periodically using remote handling equipment and may then be **PUT** into a container for shipment or storage in the pool or loading the processed activated hardware into the Dry Cask storage system.

4.2.9. High Integrity Containers (HIC):

1. For disposal at Barnwell, vendors supplying HIC's to the station shall **PROVIDE** a copy of the HIC Certificate of Compliance, which details specific limitations on use of the HIC.
2. For disposal at Clive, vendors supplying HIC's to the station shall **PROVIDE** a copy of the HIC Certificate of Conformance, which details specific limitations on use of the HIC.
3. Vendors supplying HIC's to the station shall **PROVIDE** a handling procedure which establishes guidelines for the utilization of the HIC. These guidelines serve to protect the integrity of the HIC and ensure the HIC is handled in accordance with the requirements of the Certificate of Compliance or Certificate of Conformance.

4.2.10. Lubricants and oils contaminated as a consequence of normal operating and maintenance activities may be **PROCESSED** on-site (by incineration, for oils meeting 10CFR20.2004 and applicable state requirements, or by an approved vendor process) or **SHIPPED** offsite (for incineration or other acceptable processing method).

4.2.11. Former in-plant systems GE or Stock Drum Transfer Cart and Drum Storage Areas may be **USED** for higher dose DAW storage at Clinton, Dresden, Quad Cities, Braidwood and Byron.

4.2.13 Certain waste, including flowable solids from holding pond, oily waste separator, cooling tower basin and emergency spray pond, may be disposed of onsite under the provisions of a 10CFR20.2002 permit. Specific requirements associated with the disposal shall be incorporated into station implementing procedures. **(CM-2)**

4.3. Burial Site Requirements

4.3.1. Waste sent directly to burial shall **COMPLY** with the applicable parts of 49CFR171-172, 10CFR61, 10CFR71, and the acceptance criteria for the applicable burial site.

4.4. Shipping and Inspection Requirements

4.4.1. All shipping/storage containers shall be **INSPECTED**, as required by station procedures, for compliance with applicable requirements (Department of Transportation (DOT), Nuclear Regulatory Commission (NRC), station, on-site storage, and/or burial site requirements) prior to use.

4.4.2. Containers of solidified liquid waste shall be **INSPECTED** for solidification quality and/or dewatering requirements per the burial site, offsite vendor acceptance, or station acceptance criteria, as applicable.

4.4.3. Shipments sent to an off site processor shall be **INSPECTED** to ensure that the applicable processor's waste acceptance criteria are being met.

4.4.4. Shipments sent for off site storage shall **MEET** the storage site's waste acceptance criteria.

4.5. Inspection and Corrective Action

4.5.1. Inspection results that indicate non-compliance with applicable NRC, State, vendor, or site requirements shall be **IDENTIFIED** and **TRACKED** through the Corrective Action Program.

4.5.2. Administrative controls for preventing unsatisfactory waste forms from being released for shipment are described in applicable station procedures. If the provisions of the Process Control Program are not satisfied, then **SUSPEND** shipments of defectively packaged radioactive waste from the site. **(CM-1)**

4.5.3. If freestanding water or solidification not meeting program requirements is observed, then samples of the particular series of batches shall be **TAKEN** to determine the cause. Additional samples shall be **TAKEN**, as warranted, to ensure that no freestanding water is present and solidification requirements are maintained.

4.6. Procedure and Process Reviews

4.6.1. The Exelon Nuclear Process Control Program and subsequent changes (other than editorial/minor changes) shall be **REVIEWED** and **APPROVED** in accordance with the station procedures, plant-specific Technical Specifications (Tech Spec), Technical Requirements Manual (T&RM), Operation Requirements Manual (ORM), as applicable, for the respective station and LS-AA-106. Changes to the Licensees Controlled Documents, UFSAR, ORM, or TRM are controlled by the provisions of 10CFR 50.59.

4.6.2. Any changes to the PCP shall be reviewed to determine if reportability is required in the Annual Radiological Effluent Release Report (ARERR). The Radwaste Specialist shall ensure correct information is **SUBMITTED** to the ODCM program owner prior to submittal of the ARERR.

4.6.3. Station processes, applicable site-specific cask manual procedures, or other vendor waste processing/operating procedures shall be approved per RM-AA-102-1006. Procedures related to waste manifests, shipment inspections, and container activity determinations are **CONTROLLED** by Radiation Protection Standard Procedures (RP-AA-600 Series).

1. Site waste processing **IS CONTROLLED** by site operating procedures.
2. Liquid processed by vendor equipment shall be **PERFORMED** in accordance with vendor procedures.

4.7. Waste Types, Point of Generation, and Processing Method

Methods of processing and individual vendors may **CHANGE** due to changing financial and regulatory options. The table below is a representative sample. It is not intended be all encompassing.

WASTE STREAM	POINTS OF GENERATION	AVAILABLE WASTE PROCESSING METHODS
Bead Resin	Systems - Fuel Pool, Condensate, Reactor Water Cleanup, Blowdown, Equipment Drain, Chemical and Volume Control Systems, Floor Drain, Maximum Recycle, Blowdown, Boric Acid Recycling System, Vendor Supplied Processing Systems, and Portable Demin System	Dewatering, solidification to an unstable/stable state Thermal Processing Free Release to a Land Fill
Powdered Resin	Systems - (Condensate System, Floor Drain/Equipment Drain filtration, Fuel Pool)	Dewatering, solidification to an unstable/stable state Thermal Processing
Concentrated Waste	Waste generated from Site Evaporators resulting typically from the Floor Drain and Equipment Drain Systems	Solidification to an unstable/stable state Thermal Processing
Sludge	Sedimentation resulting from various sumps, condensers, tanks, cooling tower, emergency spray pond, holding pond, and oily waste separators	Dewatering, solidification to an unstable/stable state Thermal Processing Evaporation on-site or at an offsite processor On-site disposal per 10CFR20.2002 permit

WASTE STREAM	POINTS OF GENERATION	AVAILABLE WASTE PROCESSING METHODS
Filter cartridges	Systems - Floor/Equipment Drains, Fuel Pool; cartridge filters are typically generated from clean up activities within the fuel pool, torus, etc	Dewatering, solidification to an unstable/stable state Processed by a vendor for volume reduction
Dry Active Waste	Paper, wood, plastic, rubber, glass, metal, and etc. resulting from daily plant activities	Decon/Sorting for Free Release Compaction/Super-compaction Thermal Processing by Incineration or glass vitrification Sorting for Free Release Metal melting to an ingot
Contaminated Oil	Oil contaminated with radioactive materials from any in-plant system.	Solidification unstable state Thermal Processing by Incineration Free Release for recycling
Drying Bed Sludge	Sewage Treatment and Waste Water Treatment Facilities	Free release to a landfill or burial
Metals	See DAW	See DAW
Irradiated Hardware	Fuel Pool, Reactor Components	Volume Reduction for packaging efficiencies

5. **DOCUMENTATION**

5.1.1. Records of reviews performed shall be retained for the duration of the unit operating license. This documentation shall contain:

1. Sufficient information to support the change together with the appropriate analyses or evaluations justifying the change, and

2. A determination which documents that the change will maintain the overall conformance of waste products to Federal (10CFR61 and the Branch Technical Position), State, or other applicable requirements, including applicable burial site criteria.

6. **REFERENCES**

6.1. Technical Specifications:

6.1.1. The details contained in Current Tech Specs (CTS) or Improved Technical Specifications (ITS), as applicable, in regard to the Process Control Program (PCP), are to be relocated to the Licensee Controlled Documents. Some facilities have elected to relocate these details into the Operational Requirements Manual (ORM). Relocation of the description of the PCP from the CTS or ITS does not affect the safe operation of the facility. Therefore, the relocation details are not required to be in the CTS or the ITS to provide adequate protection of the public health and safety.

6.2. Writers' References:

6.2.1. Code of Federal Regulations: 10 CFR Part 20, Part 61, Part 71, 49 CFR Parts 171-172

6.2.2. Low Level Waste Licensing Branch Technical Position on Radioactive Waste Classification, May 1983

6.2.3. Technical Position on Waste Form (Revision 1), January 1991

6.2.4. Branch Technical Position on Concentration Averaging and Encapsulation, January 1995

6.2.5. Regulatory Guide 1.21, Measuring Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants

6.2.6. I.E. Circular 80.18, 10CFR 50.59 Safety Evaluation for Changes to Radioactive Waste Treatment Systems

6.3. Users' References:

6.3.1. Quality Assurance Program (QATR)

6.3.2. LS-AA-106, Plant Operations Review Committee

6.3.3. RM-AA-102-1006, Processing Vendor Documents

6.3.4. RP-AA-600 Series, Radioactive Material/Waste Shipments

6.3.5. CY-AA-170-2000, Annual Radioactive Effluent Release Report

6.4. Station Commitments:

6.4.1. Peach Bottom

CM-1, T03819, Letter from G.A. Hunger, Jr., dated Sept. 29 1994, transmitting TSCR 93-16 (Improved Technical Specifications).

6.4.2. Limerick

CM-2, T03896, 10CFR20.2002 permit granted to Limerick via letter dated July 10, 1996.

7. **ATTACHMENTS** - None